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FINANCIAL METHODS FOR SOLID WASTE FACILITIES

RESOURCE PLANNING ASSOCIATES

PREPARED FOR
ENVIRONMENTAL PROTECTION AGENCY

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TABLE OF CONTENTS

Chapter | Page

I. INTRODUCTION 1
  Objective and Scope 1
  Methodology 2

II. SUMMARY AND CONCLUSIONS 4

III. THE SOLID WASTE SYSTEM 17
  System Description 18
    Activities 19
    Methods 20
    Equipment 26
    Cost 29
  System Trends 34
    Equipment Investment Patterns 35
    System Directions 38
    Capital Investment Forecast 41

IV. FINANCIAL MECHANISMS/TRADITIONAL ALTERNATIVES 54
  Descriptive Analysis 54
    Municipal Borrowing 56
      Financial Institutions 56

Chapter Page

General Obligation Municipal Bonds 59
Municipal Revenue Bonds 65
Bank Loans 70
Leasing 71
Current Revenue Capital Financing 72
Private Financing 74
Traditional Mechanisms 74
Industrial Revenue Bonds 76
Leveraged Leasing 80
Accelerated Depreciation 82
Evaluative Analysis 84
General Obligation Bonds 87
Municipal Revenue Bonds 94
Bank Loans 103
Leasing 108
Current Revenue Capital Financing 111
Private Financing 115

V. ORGANIZATIONAL ALTERNATIVES FOR FINANCING AND MANAGEMENT 119
Public Authority 121

Chapter Page

Private Corporations 126

Non-Profit Public Corporations 132

Multi-Community Cooperatives 135

VI. FINANCIAL MECHANISMS/ ASSISTANCE PROGRAMS TO STIMULATE INVESTMENT 140

Grant Programs 143

New York Environmental Quality Bond Act of 1972 145

Tennessee Annual Per Capita Grant 147

Federal Construction Grants: Water Treatment 149

Hill Burton Grants 151

Evaluation 153

Credit Banks and Loans 159

Vermont Bond Bank 161

New York Environmental Facilities Corporation 163

Federal National Mortgage Association 166

Environmental Finance Authority 169

Urban Development Bank 172

Farmers' Home Loan Program 174

Evaluation 175

Chapter Page

Interest Subsidies and Loan Guarantees 179

  Municipal Capital Market Expansion Act (S.3215) 181

  Government National Mortgage Association 184

  Hill Burton Loans and Loan Guarantees 186

  Evaluation 187

CASE STUDIES 193

EXPLANATION 195

TABLES

Case Summary Information - General 196

Case Summary by Population 198

Case Summary by Financial Mechanism Used 199

Case Summary by Organizational Form 200

Case Summary by Processing/Disposal System Type 201

CASE STUDIES

CITIES

Atlanta, Georgia 202

Braintree, Massachusetts 207

Brookhaven, New York 211

Cheyenne, Wyoming 216

Denver, Colorado 218

Des Moines, Iowa 222

Great Falls, Montana 228

Harrisburg, Pennsylvania 233

Hot Springs, Arkansas 239

Kansas City, Missouri 242

Knoxville, Tennessee 245

Malden, Massachusetts 249

Memphis, Tennessee 255

Minneapolis, Minnesota 259

Nashville, Tennessee 264

New Orleans, Louisiana 270

New York City, New York 276

Portland, Oregon 284

St. Louis, Missouri 290

Saugus, Massachusetts 294

Seattle, Washington 299

COUNTIES AND REGIONAL SYSTEMS

Allegheny County and Pittsburg, Pennsylvania 304

Arbuckle Regional Development Authority 309

Baldwin County, Alabama 313

Brevard County, Florida 318

Broward County, Florida 323

DeKalb County, Georiga 327

Orange County, Florida 332

Sacramento County, Califormia 339

San Diego County, California 344

Southeastern Oakland County Incinerator Authority, MIchigan 346

Ventura County, California 352

Weber,County, Utah 356

STATES

Colorado 359

Idaho 363

Vermont 366

Washington 370

Wyoming 373

I. INTRODUCTION

Objective and Scope

This study was undertaken by Resource Planning Associates, Inc. under contract to the Environmental Protection Agency. The purpose of the study was to assist in the development and evaluation of federal policies regarding the financing of solid waste facilities and equipment. The focus of this report is on an analysis of municipal needs for solid waste capital and the alternative methods of financing these capital needs.

The research undertaken as part of this report had several goals. First was to describe the solid waste system in the context of identifying the requirements for capital. Second was to fully describe the operation of all municipal financing techniques presently used for solid waste projects so that they could be evaluated relative to particular applications. This evaluation was based on a set of criteria developed internally. The final goal was to describe and evaluate several alternative financial subsidies for stimulating municipal solid waste investment.

The report contains the major findings of the research followed by four chapters which describe, analyze and evaluate capital financing mechanisms. Thirty-eight case studies were prepared as part of the research effort. These studies were a major source of data used in the report.

Methodology

The approach to the study was divided into three phases. First, an analysis of the solid waste system was undertaken to determine its technical components, the cost of these components, and the cost of resulting systems. The results of this activity are presented in Chapter III. Second, a description and evaluation of traditional financing mechanisms was made. In addition, organizational arrangements used primarily as financing alternatives were examined. The results of this work are contained in Chapters IV and V. Third, financial mechanisms that could be used to stimulate investment were analyzed and evaluated. This analysis is contained in Chapter VI.

Chapter III deals specifically with the physical components of the solid waste system. This section is primarily descriptive and provides an examination of the level of dollars needed if a system was to be upgraded or a new system implemented. Three sources were used to develop this data:

- Equipment manufacturers and distributors;
- Research reports on various solid waste activities; and
- Visits to communities.

In determining the present stature of the solid waste system, it became important to determine what directions the systems may take in the future in order to give perspective to future requirements for capital in solid waste. Technical trends are discussed and followed by a forecast of capital expenditures for the next decade. Several estimates are made based on the likelihood of investment in different types of systems.

Chapter IV deals directly with financial mechanisms. It is divided in two parts. First is a descriptive discussion of traditional municipal financing alternatives and the way they have been used to provide capital for solid waste systems. Information for this area was developed from five sources:

- Literature research;
- Interviews with finance and economics professors;
- Interviews with investment and commercial bankers;
- Interviews with municipal financial advisers and legal counsel; and
- Visits to communities.

The second part of Chapter V contains an evaluation of each traditional mechanism based on a number of criteria.

Chapter IV covers the institutional arrangements developed to finance and manage solid waste systems. It contains a discussion of the alternative organizations that may be utilized to finance and operate a solid waste system. Data for this section was developed primarily from field visits, including interviews with legal counsel, private firms, and city and state officials.

Finally, Chapter VI discusses the applicability of alternative government subsidy programs to stimulate solid waste investment. This chapter is divided into two parts. The first part contains a descriptive presentation of several subsidy concepts along with examples. The material used was developed from:

- Literature research;
- Interviews with government agencies;
- Interviews with investment bankers; and
- Interviews with financial officers of private companies in the solid waste field.

Following the descriptions is an evaluative discussion of each subsidy concept based on criteria.

II. SUMMARY AND CONCLUSIONS

The purpose of this chapter is to present an abstract of the information contained in the report. It also reports on conclusions associated with each chapter and finally makes a recommendation for federal policy. Naturally, the complete documentation and evidence for each point cannot be presented. Instead, the basic points are outlined and the conclusions presented. Reading this section will provide a general knowledge of what the report states and why, without presenting in detail the evidence for its conclusions.

Solid Waste Systems

1. System Description

Prior to the passage of the Solid Waste Act of 1965, an estimated 90 percent of all collected solid wastes was disposed of in landfills. Approximately 94 percent of these facilities were open dumps rather than sanitary landfills. The remainder of the collected wastes were largely incinerated; a very small fraction was either composted, recycled, or processed in some other way. With the exception of rolling stock, capital requirements for solid waste facilities and equipment at that time were quite modest.

The combined factors of increased public awareness of environmental quality and the need for resource recovery and the passage of anti-pollution legislation throughout all levels of government have given solid waste management facilities a new priority. Specifically, we can point to four changes in the climate of solid waste investment:

1. There has been a significant investment to upgrade open dumps and to install pollution control equipment on newer incinerators.

2. States have begun to encourage local investment to provide solid waste disposal facilities to previously unserved areas. This investment has been almost exclusively in sanitary landfills.

3. The high cost of pollution control and risk of violations has caused a marked decrease in new incinerator construction and the closing of many older facilities.[1]

4. The need for non-polluting volume reduction technologies in urban areas has generated some experimentation with other forms of processing such as high pressure compaction and pulverization.

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[1] See Chapter III, The Solid Waste System, page 36.

2. Trends

The increased scarcity of land available for disposal sites, public anger over all types of pollution, and the new enthusiasm for resource conservation have motivated government and industry to develop innovative technologies for solid waste disposal. Significant increases in capital expenditures will be required for systems other than sanitary landfills. Municipal investment in new solid waste facilities has been slow, however, due to their cost and technological uncertainty, and this trend can be expected to continue.

In support of this statement, we offer a forecast of municipal capital expenditures in solid waste disposal for the next decade based on assumptions about different types of solid waste systems in the planning stages. These ten-year cumulative expenditures estimates range from $1 to $7.5 billion.[1] For comparison, the most conservative forecast of aggregate municipal borrowing for all purposes would yield a cumulative figure in excess of $220 billion over the next ten years. Thus, we cannot expect solid waste capital expenditures for disposal to exceed even one percent of total municipal capital expenditures.

Conclusions

There is a trend toward investment in more capital intensive and environmentally acceptable solid waste systems. The passage of federal and state regulations has done much to stimulate this trend and continued enforcement should maintain this stimulus. Based on observations to date, legislative pressure seems to be an efficient mechanism for generating capital investment in solid waste.

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[1] See Chapter III, Solid Waste System, page 44.

Financial Mechanisms/Traditional Alternatives

Municipalities commonly draw from three basic sources to obtain capital for facilities and equipment: borrowing, current revenues, and private enterprise. Each of these alternatives has particular advantages and disadvantages that direct its use to specific situations.

1. Municipal Borrowing

Among all borrowing mechanisms available, general obligation bonds provide the most flexibility to a community. They can be used to fund any size project, and the intended capital expenditure program has no effect on either the ability to use the mechanism or the cost of using it. Further, several small projects can easily be grouped together to obtain capital, making general obligation bonds an ideal mechanism for funding solid waste systems in small- and medium-sized communities. On the negative side, voter approval, when required, may delay the project and increase the costs. An effective minimum bond size of $500,000 prevents very small communities from employing municipal borrowing; moreover, this source does not create incentives for initial analysis or subsequent good management of a facility.

Municipal revenue bonds provide an important alternative to general obligation bonds for obtaining large amounts of long-term capital. Often they are used to circumvent the constraints associated with general obligation bonds. They are used for single-project financing and are used for revenue-producing services. Because bond principal and interest payments must come from the net revenue generated by the funded project, this source of funds necessitates the preparation of extensive information about the project's economic and technical viability. However, these analyses are often performed in a perfunctory manner. In many instances the revenue bond is structured in such a way that the project risk is transferred from the investor to the municipality, thus reducing the interest cost. Finally, this mechanism has been used relatively infrequently to fund solid waste systems because of the effective minimum size issue of about $1 million.

Municipal bank loans cannot be considered an alternative to bond financing except in marginal situations. Their most typical use in the solid waste field has been to supply short-term funds for rolling stock. However, since this is a relatively inexpensive method for acquiring capital, bank loans are likely to become an important means by which small communities can finance solid waste processing equipment for terms up to five years.

The final borrowing mechanism potentially available to a municipality is leasing. Leasing, like a bank loan, can be used only for short-term capital requirements. This feature along with its high cost have precluded its use by municipalities except for very short time periods and unusual circumstances.

2. Current Revenue Financing

Historically, the most common method for obtaining capital equipment for use in a solid waste system has been the "pay-as-you-go" technique. The principal advantage of this source of funds is its simplicity--no institutions outside of the municipality are involved, and no requirements for information, analysis or legal conformity exist. However, the feasibility of revenue financing depends on the surplus-making capacity of a network of sectors in a municipal bureaucracy. Further, each proposed program finds itself a competitor with all other projects for funds, and no one program is likely to receive its full request. In the solid waste area, current revenue financing has been used mainly for landfill disposal systems and collection vehicles.

3. Private Financing

The third alternative for a community seeking to obtain capital equipment for use in a solid waste system is to contract with a private firm to raise the capital, purchase the equipment, and operate the system. This approach has been relatively common on the collection end of the system, but its use for processing and disposal facilities generally has been limited to landfill operations. More recently, private firms have expressed greater interest in entering the processing/resource recovery and disposal segments of solid waste management. Several mechanisms exist that allow the municipality to act as intermediary in the capital formation process. Thus the Federal interest subsidy is passed on to the private firm without the city's accepting any risk. The biggest deterrents to a privately financed and operated system are the complex series of public and private negotiations and the legal intricacies associated with long-term municipal contracts.

4. Conclusions

In conclusion, our observations suggest that despite the reality of financing difficulties, the range of traditional sources has been adequate for obtaining solid waste investment capital. In fact, because revenue bonds and private financing cannot be used for many municipal projects, we can say that solid waste enjoys a greater number of financing options than do other programs.

We do not mean to suggest that solid waste systems have been adequately funded. None of the financing mechanisms here discussed exert influence on the existing municipal priorities or on the municipal capital allocation processes. In actuality, solid waste systems have not received adequate investment capital even though the financing mechanisms exist.

Organizational Alternatives for Financing and Management

Four generic organizational forms are commonly used by municipalities to by-pass possible financial, public opinion or jurisdictional problems: (1) public authority, (2) private corporation, (3) non-profit public corporation, and (4) multi-community cooperative.

1. The Public Authority

The public authority enables a municipality to arrange financing outside a municipal debt limit, to by-pass voter approval of a bond issue and to operate a regional revenue-providing facility. The authority has the advantage of flexible geographic jurisdiction; it has the ability to issue debt and provide services while being removed from the municipal bureaucracy. On the other hand, the authority is isolated and removed from the public it serves. It finds its roots in government but enjoys immunity protected from government control, and hence, from important checks and balances of our political system.

2. Private Corporation

The private corporation is an effective mechanism to which government can transfer the business of solid waste collection and disposal. In terms of solving a municipal finance dilemma, the private corporation can completely remove a city's need to raise capital for facilities or equipment. The private corporation provides the city with significant solid waste system flexibility, in that the city can shift to another system if dissatisfied with the results being obtained. The private corporation can also provide regional services as long as contracts can be secured. However, a municipality does lose some control because it is no longer the owner of the system.

3. The Non-Profit Public Corporation

The non-profit public corporation, like the authority, enables a municipality to shift its finance requirements to an organizatin outside the municipal bureaucracy. It is traditionally 100 percent debt-financed and has no assets other than those for which it was formed. Unlike the authority, the non-profit corporation is not confined by geographical boundaries. Thus, it can offer tax-exempt debt issues without concern for the municipal debt deiling or voter approval. However, the non-profit corporation is removed from the public and is not controlled or directed by the people it serves or the government that formed it.

4. The Multi-Community Cooperative

The multi-community cooperative is a regional organization in which one community provides a single solid waste system for itself and others. The multi-community approach enables the centralization of waste processing and disposal services, thereby expanding the range of potential technical options that can be efficiently considered. Small, inefficient and substandard facilities can be eliminated. However, the managing community must bear the risks of its members' sometimes erratic support and participation.

5. Conclusions

The most significant value associated with alternative organizational forms lies in their capacity for use in regional solid waste facilities and equipment. The potential economies of scale from merging several municipalities often outweigh the political, legal and administrative problems that can occur. Individual states and cities are best able to judge when the regional solution to solid waste problems is feasible.

Financial Mechanisms/Assistance Programs to Stimulate Investment

The conclusion to Chapter IV provides a frame of reference for examining the effects of different financial stimuli on the process of allocating investment dollars to solid waste projects. If national goals are established which call for a greater annual level of investment in this sector, the government can provide investment stimuli in many ways. This chapter deals only with financial mechanisms designed to stimulate this investment. Three classes of assistance programs are examined: grant programs, credit banks, and interest subsidies.

1. The Grant Program

The grant program is a direct cash transfer payment from one organization to another providing a percentage of the funds needed for a given project. A construction grant program in solid waste, either at the state or federal level, will be the most direct method of stimulating investment in capital intensive systems. Further, a grant program can stimulate technological innovation and experimentation; more communities feel less risk-averse if another agency is absorbing a large fraction of the initial cost.

But many difficulties are built into grant programs. Foremost is the artificial encouragement that is provided for construction of capital-intensive systems at the expense of other methods. This disadvantage is intensified in the field of solid waste processing, since the most efficient technology has yet to be determined. Further, the processing of grant applications leads directly to large administrative expenditures. The administrative structure and the procedures tends to protract the time from the initial idea to construction; over time, costs rise and projects frequently cannot be completed for the proposed cost.

2. Credit Banks and Loan Programs

Credit banks provide less of a stimulus to investment than grant programs because the absolute level of the subsidy is lower. Credit banks are organizations that combine the debt issues of many municipalities. The credit bank offers a municipality a reduced interest and transaction costs on a bond issue. Through the credit bank, a small- and medium-sized community has access to capital at less cost than it could achieve alone. Some credit banks offer such ancillary services as project review and system planning, thus making available services that encourage efficient investment decisions.

Credit banks in general do not benefit solid waste any more than any other program unless the bank specializes in environmental or solid waste debt issues. Further, the credit bank alone, by easing the difficulties of acquiring capital, does not necessarily encourage good analysis and planning of municipal investments.

3. Interest Subsidies and Loan Guarantees

The interest subsidy program requires that a municipality negotiate for funds in the capital market place. It makes a direct cash payment to the municipality and the amount is a function of the loan size and market interest rate. The subsidy is not tied to the project, hence, no incentive for project analysis is created. If the subsidy is program-oriented, as a subsidy for solid waste loans would be, an incentive to invest in a more capital-intensive system is created. However, since the absolute amount of the subsidy payment is small relative to the capital requirement, it is unlikely that the existence of the program alone would stimulate much investment.

4. Conclusion

Among the three investment stimuli there is little doubt that the most rapid and efficient method is the grant. It is not, however, the most desirable because it stimulates capital intensive solutions in a field where many other options should be evaluated.

The credit banks offer considerable value to smaller communities and less populated states in reducing the cost of capital and providing an access to broader money markets. It is also possible to combine this financing mechanism with the provision of technical advice--an especially useful service to smaller communities.

Major Findings and Recommendations

An increased awareness of the environmental impact of offensive solid waste disposal practices has emphasized the insufficient level of capital investment throughout the nation. Essentially, two major factors have been identified as potentially inhibiting adequate investment expenditures. The first relates to the municipal decision-making process that allocates funds among competing public projects. The second concerns the capacity of existing financing mechanisms to supply capital for solid waste system requirements. This study was commissioned by the Federal Environmental Protection Agency to examine the second issue in order to assist its personnel in "developing and evaluating Federal policies relating to the financing of solid waste facilities and equipment."

After much data-gathering and analysis, it became obvious that the ability to raise capital for solid waste has not been a constraint. The demand for capital has not exceeded the capabilities of traditional mechanisms and sources of capital. Thus the municipal decision-making process appears to be the principal obstacle to adequately-funded solid waste systems. Data developed in this report indicates that to insure progress towards environmentally sound systems, the following constraints must be addressed.

- Despite recent public interest in environmental quality, solid waste disposal continues to occupy a low position on the list of municipal investment priorities.

- Most communities have a limited ability to evaluate technologically complex systems or to perform sufficient economic analysis. Thus investment spending is both retarded and frequently misdirected.

- Furthermore, even economic and technical advice provided by independent consulting groups has too often been inadequate. Frequently the advice merely advocates a point of view rather than providing a thorough analysis of the alternatives most appropriate to fit community needs.

- Solid waste facility site selection problems, stemming from limited land availability and

- adverse public reaction, have caused significant delays in facility planning and construction.

- Development of regional solid waste systems has been hindered by the inability of local political jurisdictions to cooperate.

The only ways to overcome these constraints lie at the state and local levels. Hence the role of the Federal Government should be to encourage activity in these sectors. It is recommended that future federal solid waste policies be developed with this consideration in mind.

- Specifically, government programs which subsidize investment costs are an inefficient means of assisting municipalities to develop acceptable solid waste systems. Other types of government assistance programs should require less dollar outlay to achieve the same results.

We suggest that potential programs for increasing state and local activity can be found in these areas:

- Federal legislation to establish minimum solid waste disposal standards, together with enforcement procedures.

- Benefit-in-kind assistance to state and local governments, including information exchange, technical assistance and training, procedures for technical and economic evaluation, and identification of financing alternatives.

III. THE SOLID WASTE SYSTEM

The objectives of this section are twofold: first, to set forth the capital requirements for solid waste facilities and equipment; second, to discuss how trends in disposal technology affect the amount of capital needed, and the risk associated with this type of investment.

The section begins with a description of the physical components of solid waste systems. Capital costs for various types of equipment and components are presented. This is followed by a description of the capital requirements for four hypothetical systems.

The second part of this section deals with trends in solid waste technology, and describes how these trends may redefine the amount of capital required for total systems and system components. Last is a discussion of how these trends may influence risk investment from an economic and a technological standpoint.

System Description

Within the total set of alternatives for handling solid wastes, certain activities may be necessary or particularly valuable in a given area. Furthermore, there are several valid methods for performing each of these activities, as well as a variety of appropriate equipment.

As a prerequisite to an examination of total system costs, it is useful to discuss how all of these various components inter-relate. Thus, the solid waste management system will be discussed in terms of: (1) activities, (2) methods, and (3) equipment.

Activities

Solid waste management usually includes the following activities: storage, collection, hauling, transfer, processing, and disposal. Discussion in this study, however, will be limited to those activities which have significant capital requirements. These are:

- Collection;
- Transfer;
- Processing;
- Disposal.

The term "collection" will be used to describe all activities occurring between the point of refuse pickup (usually some form of storage equipment) and the transfer station, processing plant, or disposal site to which refuse is delivered.

The term "transfer" will refer to the activity of transferring refuse from collection vehicles to larger-capacity, compacting or non-compacting hauling vehicles, for the purpose of reducing total travel time and costs.

The term "processing" will refer to any treatment designed (1) to reduce the volume of solid waste, or (2) to recover resources. The latter procedure can, in turn, be subdivided into "materials recovery" and "energy recovery."

Finally, the term "disposal" will refer only to the ultimate disposition of solid wastes. Federal law currently limits disposal to sites on land.

Methods

For each of the activities listed above, there are several possible methods for handling solid wastes. The following is a representative list:

Collection

1. Manual.
   Nearly all residential, commercial, and industrial solid wastes are collected by one- to four-man crews operating some type of compacting truck.

2. Pneumatic.
   In this experimental system, refuse is fed directly into pneumatic tubes that lead to a centralized storage facility. One system is currently in use in Disneyworld.

3. Liquid.
   This system is still in the proposal stage. Refuse is to be pulverized and fed into a sewer system in slurry form. Some residential garbage is currently collected in this manner, vie home garbage disposal units.

Transfer

1. Direct-dump, non-compacting.
   Collection trucks dump refuse directly into open-top, non-compacting transfer trailers, or onto a temporary storage area. These trailers usually have about three times the cubic-yard capacity of standard collection trucks.

2. Compaction.
   Collection trucks unload refuse into large, stationary compactors which then reduce it in volume. Refuse is next forced into closed transfer trailers.

Processing

1. Incineration.
   Refuse is burned in excess oxygen, to achieve 85-95 percent volume reduction and 60-65 percent weight reduction. Approximately 8 percent of all municipal refuse collected in the United States is processed in incinerators.

2. Shredding.
   Solid wastes are ground up or pulverized in order to achieve greater densities in landfills. Shredding may also be used to prepare wastes for the separation process.

3. Baling.
   Wastes undergo high-pressure compaction, to achieve 90-95 percent volume reduction and a doubling of the density in landfills. Three such facilities are currently operating in the United States.

4. Separation.
   Refuse is separated mechanically and basic materials are reclaimed. One demonstration system built by Black Clawson is currently in operation.

5. Composting.
   This is the biological degradation of the organic component in solid wastes by grinding, conditioning and aerobic decomposition into a sanitary, humus-like material. As of 1971, two plants were operating in the United States.

6. Pyrolysis.
   In this process, chemical breakdown of organic material results in 95 percent volume reduction. Breakdown is achieved by heating wastes to extremely high temperatures in an oxygen-deficient atmosphere. Two systems are soon to be built under EPA demonstration grants.

Disposal

1. Landfilling.
   Solid wastes are dumped at a particular site. In "sanitary landfills", refuse is compacted and covered daily with a layer of earth by large earth-moving vehicles. All current solid waste systems must eventually use landfills to dispose of some portion of collected wastes.

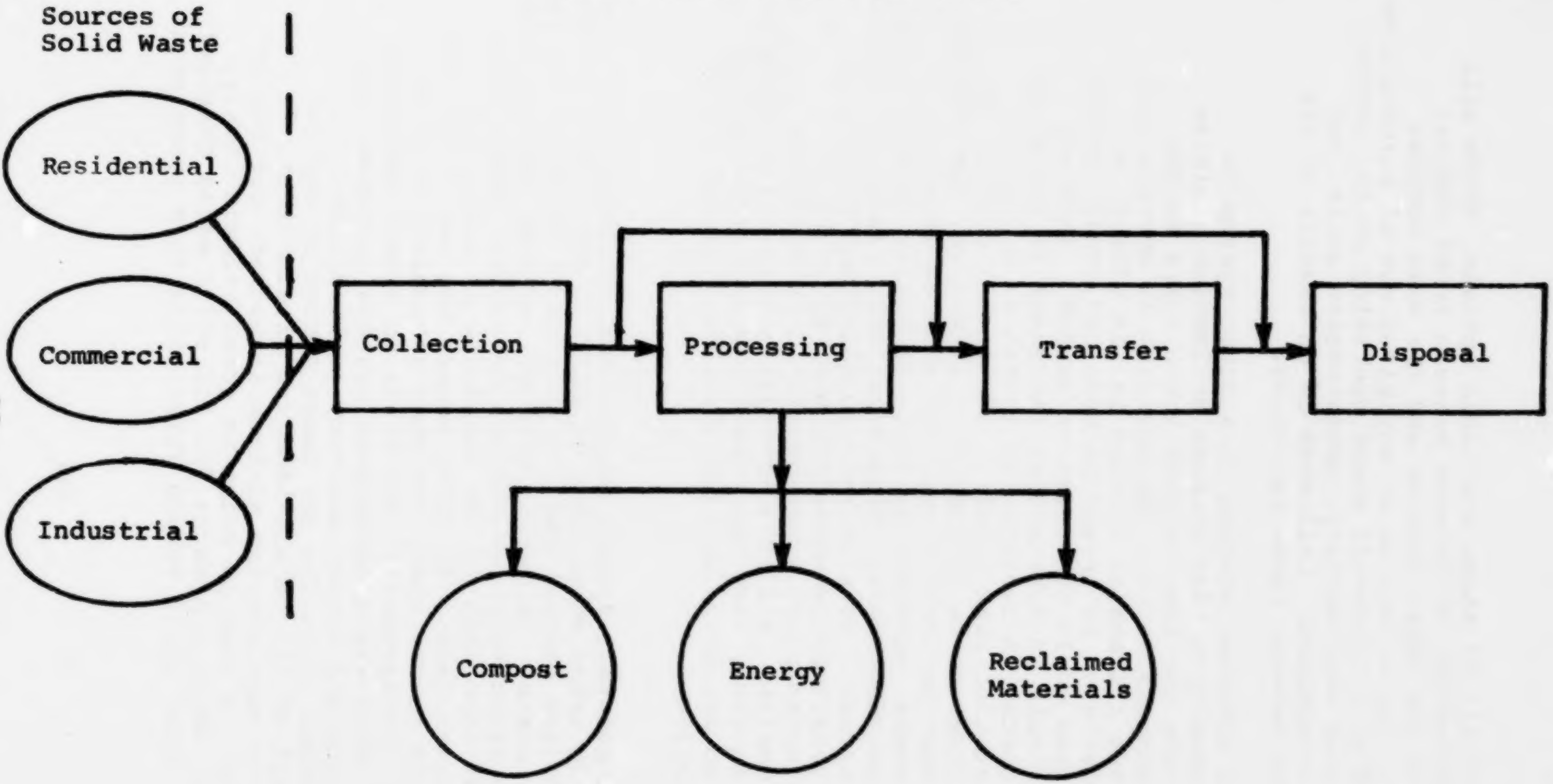
2. Ocean Dumping.
   The direct dumping of solid wastes into the ocean is prohibited by federal law.

In this first section, only those methods whose technological and economic feasibility has been proven will be presented. Discussion of newer technologies will be deferred to a later section.

In Figure III-1, one can see how the four activities may be combined according to the type of system in use. Both the collection and disposal components shown in this chart are essential to any solid waste system. (The exception might be a system in which 100 percent recycling is achieved.) However, one notes from the flow lines that the inclusion of transfer and/or processing operations in any given system is optional. Furthermore, there are a variety of ways to accomplish each activity. And finally, each procedure can be performed by several different pieces of equipment.

Figure III-1

SOLID WASTE SYSTEM COMPONENTS



With all of these available options, there will be a substantial difference between total capital costs for the least complex and the most complex systems. The selection of any given set of alternatives is based on a trade-off among operating costs, capital costs, land availability, conservation goals, and public acceptance. Following is an example of the interplay between these variables.

- A transfer station in a given system is usually needed because collection vehicles take too long to make round trips to the disposal site. The decision to operate without a transfer station is, in effect, a decision to invest in more collection trucks than would otherwise be needed. This may result in substantial increases in operating costs. A decision to invest in a transfer station also involves additional costs. In order to be economically effective, the station must be located near the sources of solid waste, possibly in close proximity to residential neighborhoods. This inevitably causes a community uproar. To eliminate neighborhood antagonism, considerable attention must be given to landscaping, truck routing, and building design. All this translates into extra dollars. In fact, many municipalities have been unable to purchase land for transfer stations at any price.

In general, system capital and operating costs are higher in urban areas than in rural areas. This is true for absolute cost(s) and for per-ton of capacity (or per-person) costs. In rural settings, several factors account for the relatively low capital investment requirement. The most important is the abundance of relatively inexpensive land. In rural areas, the use of sanitary landfills is obviously the most economical disposal choice. Consequently, one finds an almost exclusive use of solid waste management systems incorporating collection and direct delivery to landfills. Since this arrangement calls for the least amount of capital equipment of all refuse-handling alternatives, it obviously requires the minimum investment per ton of capacity. A case in point is rural Baldwin County, Alabama, which contracts for its solid waste disposal with a local earth moving firm. This firm operates a sanitary landfill in which it disposes of all solid waste for a fixed fee of $1.42 per ton, exclusive of property lease payments and utilities.

In addition to the characteristically lower costs of rural disposal, the abundance of land in rural areas often means there is little public or legislative pressure to upgrade disposal operations. In some areas, this laissez-faire attitude often means there is no attempt to prohibit open dumping.

This was found to be particularly true in the plain states and rocky mountain states where much of the land is geologically well-suited for landfills and when population densities are particularly low.[1]

One finds almost the complete reverse in urban areas: land is scarce and very expensive; public concern is high; and local legislation has imposed stringent restrictions on solid waste operations. Under these conditions, there is a strong impetus to use equipment that can improve operating efficiency, and reduce the volume of solid waste going into the ground. The use of transfer stations and large processing plants (e.g., incinerators, balers, shredders) is considerably more commonplace, and solid waste investment per ton of capacity is higher. In Pittsburgh, Pennsylvania, an abandoned strip mine is being landfilled under private contract for a fee of $7.20 per ton (compared to $1.42 in Alabama). Where incineration is found necessary total per ton costs can go as high as $20 per ton, such as is the case in Braintree, Mass. and investment per ton of capacity can be in the $15,000 to $20,000 range.

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[1] This information was developed in accordance with the methodology described on Page 41.

Equipment

While dealing conceptually with combinations of activities and methods that may be incorporated into a solid waste system, the decision-maker must also determine what equipment is needed for each combination, and its cost. In Figure III-2, there is a catalog of the most commonly used solid waste equipment. List prices were obtained from equipment manufacturers.

The table reveals a wide range of prices for much of the equipment. These prices have increased as specifications have become more stringent. In recent years particularly, buyers have demanded better performance and more sophisticated technology. Prices have also been affected by steadily rising construction costs. Perhaps the most striking contribution of these two factors is illustrated in Figure III-3, which shows the increase in the cost of incinerator installations.

Source: 1. Period '48-'68, American Society of Civil Engineers, Committee on Sanitary Engineering Research. Unpublished data.

2. Resources Planning Associates. Unpublished data.

Figure III-2

SOLID WASTE EQUIPMENT COSTS

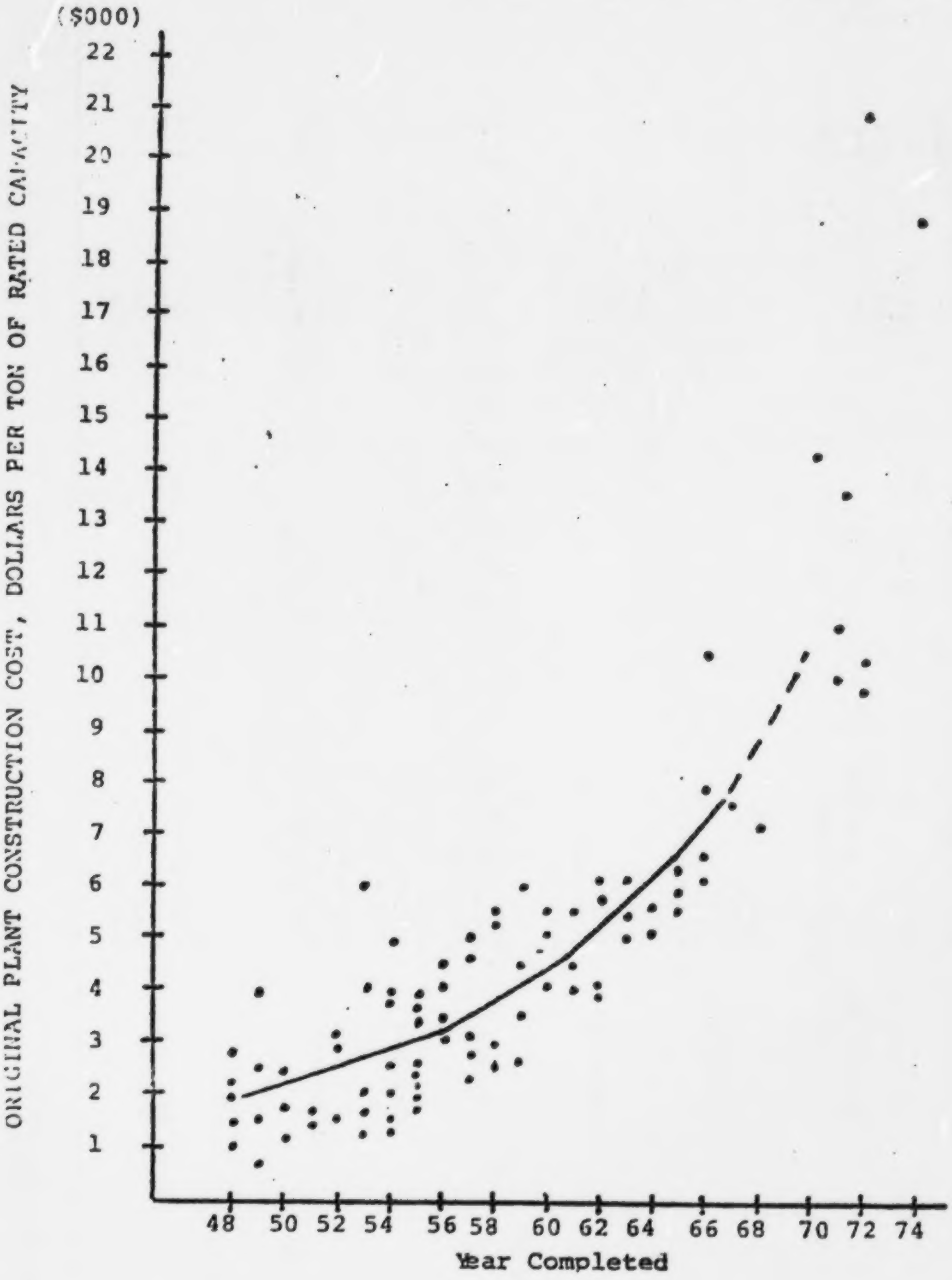
ACTIVITY	METHOD	EQUIPMENT	CAPACITY	APPROX. CAPITAL COST	APPROX. USEFUL LIFE (years)
COLLECTION	Rear Loading	Body	16-30 yd.^{3}	$ 7K-12.5K	5-8
		Chassis	--	$12K-22K	5-8
	Front Loading	Body & Chassis	25-35 yd.^{3}	$24K-34K	5-8
	Side Loading	Body & Chassis	10 yd.^{3}	$15K	5-8
TRANSFER	Direct Dump, Non-Compacting	Open Trailer	65 yd.^{3}	$ 9K	10
		Tractor	--	$18K-20K	10
		Scale	--	$10K-25K	-
		Front End Loader	--	$20K-40K	-
		Building	--	$100K-1.5MM	-
	Compaction	Trailer	65-75 yd.^{3}	$18K-24K	10
		Tractor	--	$18K-20K	-
		Scale	--	$10K-25K	-
		Front End Loader	--	$20K-40K	-
		Building	--	$100K-1.5MM	-
PROCESSING	Baling	Plant (including conveyors, front-end loader & bldg.)	470 ton/24 hr.*	$532K	20-30
			1100 ton/24 hr.*	$1.075MM	20-30
			1550 ton/24 hr.*	$1.690MM	20-30
	Shredding	Plant (including shredder, 2 conveyors, bldg.)	85 ton/24 hr.**	$100K-150K	20
			260 ton/24 hr.**	$300K-400K	20
			700 ton/24 hr.**	$800K	20
	Incineration	Entire Plant			
		(w/o energy recov.)	12.5-600	$75K-$6.2MM	20-25
		(w/ energy recov.)	240-1600 tons per day	$2,75M-23MM	20-25
DISPOSAL	Sanitary Landfill	Building	--	$5K-20K	-
		Crawler Dozer	20-50,000 lbs.	$45K-70K	5-10
		Scraper	24 yd.^{3}	$95K-105K	5-10
		Wheel Loader	4.5 yd.^{3}	$58K-65K	5-10
		Scales	--	$15K-25K	-

* 85 percent utilization

** 70 percent utilization (1 shift for maintenance)

Figure III-3

INCINERATOR CAPITAL COST PER TON OF CAPACITY



Source: 1. Period '48-'68 ASCE, Committee on Sanitary Engineering Research

2. RPA Field Research

Costs

Figures III-4 through III-7 show the differences in total system costs and in annual costs for alternative solid waste systems. Four hypothetical cases are presented with costs.

Case 1: Population 50,000.
Solid waste disposal system(s)
- Simple sanitary landfill

Case 2: Population 100,000.
Solid waste disposal system(s)
- Simple sanitary landfill
- Shredding and landfill
- Incineration and landfill

Case 3: Population 250,000.
Solid waste disposal system(s)
- Simple sanitary landfill
- Shredding and landfill
- Incineration and landfill

Case 4: Population 500,000.
Solid waste disposal system(s)
- Simple sanitary landfill
- Shredding and landfill
- Incineration and landfill

Calculations were based on the figures presented in Figure III-2. These figures are extrapolations based on field research and the assumptions listed in Figure III-11 in the appendix.

In Figures III-4 through III-7, only the landfilling option is computed for Case 1. This is because a community of 50,000 people would rarely consider any other investment alternatives. The size of the population and the likelihood that adequate landfill sites could be located are the determining factors. In fact, areas in this population size category that have abundant unused land are inclined to use open dumps. In this way, capital requirements can be reduced by $115,500 - $142,500, or one-third of total system costs. (See Figure III-4.)

Figure III-4

HYPOTHETICAL SOLID WASTE SYSTEM

Case 1

POPULATION	50,000
SOLID WASTE GENERATION	100 Tons/Day

Facilities & Equipment	Number	Initial Capital Cost[1]	Annual Capital Cost[2]
OPTION 1: Simple Sanitary Landfill (No Processing)			
COLLECTION			
Trucks	10	$250,000	$50,000
DISPOSAL			
Landfill	(100 acres)		
Site Development		15,000-30,000	1,500-3,000
Building	1	8,000-10,000	800-1,000
Scales	1	12,500	1,250
Crawler/Dozer	1	30,000-40,000	3,000-4,000
Scraper (15 cu.yd.)	1	50,000	5,000
TOTAL INVESTMENT		$365,500-392,500	
TOTAL ANNUAL COST			$61,550-64,250
TOTAL INVESTMENT PER TON DAILY CAPACITY		$3,655-3,925	

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[1] Excludes cost of land.
[2] Annual Cost = Capital cost ÷ useful life

Figure III-5

HYPOTHETICAL SOLID WASTE SYSTEM

Case 2

POPULATION 100,000

SOLID WASTE GENERATION 200 Tons/Day

Facilities & Equipment	Number	Initial Capital Cost[1]	Annual Capital Cost[2]
OPTION 1: Simple Sanitary Landfill (No Processing)			
COLLECTION			
Trucks	21	$525,000	$105,000
DISPOSAL			
Landfill	(200 acres)		
Site Development		20,000-40,000	2,000-4,000
Building		10,000-15,000	1,000-1,500
Scales		15,000	1,500
Crawler/Dozer	1	60,000	6,000
Loader	1	50,000	5,000
Scraper (25 cu.yd.)	1	100,000	10,000
TOTAL INVESTMENT		$780,000-805,000	
TOTAL ANNUAL COST			$130,500-13[illegible],000
TOTAL INVESTMENT PER TON DAILY CAPACITY		$3,900-4,025	
OPTION 2: Shredding/Landfill			
COLLECTION			
Trucks	21	$525,000	$105,000
PROCESSING			
Shredder		300,000-400,000	15,000-20,000
TRANSFER			
Tractor-Trailer Sets	2	70,000	14,000
DISPOSAL			
Site Development		20,000-40,000	2,000-4,000
Building		10,000-15,000	1,000-1,500
Crawler/Dozer	2	100,000	10,000
TOTAL INVESTMENT		$1,025,000-1,150,000	
TOTAL ANNUAL COST			$147,000-154,500
TOTAL INVESTMENT PER TON DAILY CAPACITY		$5,125-5,750	
OPTION 3: Incineration/Landfill			
COLLECTION			
Trucks	21	$525,000	$105,000
PROCESSING			
Incinerator		2,750,000	137,500
TRANSFER			
Dump Truck	1	15,000-20,000	3,000-4,000
DISPOSAL			
Site Development		10,000	1,000
Crawler/Dozer		30,000-40,000	3,000-4,000
TOTAL INVESTMENT		$3,330,000-3,345,000	
TOTAL ANNUAL COST			$249,500-251,500
TOTAL INVESTMENT PER TON DAILY CAPACITY		$16,650-16,725	

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[1] Excludes cost of land.
[2] Annual Cost = Capital cost ÷ useful life

Figure III-6

HYPOTHETICAL SOLID WASTE SYSTEM

Case 3

POPULATION 250,000

SOLID WASTE GENERATION 500 Tons/Day

Facilities & Equipment	Number	Initial Capital Cost[1]	Annual Capital Cost[2]
OPTION 1: Simple Sanitary Landfill (No Processing)			
COLLECTION			
Trucks	52	$1,300,000	$260,000
TRANSFER			
Site Development		20,000	2,000
Building	1	250,000	25,000
Scales	1	15,000	1,500
Wheel Loader	1	30,000	3,000
Tractor-Trailer Sets	8-9	280,000-315,000	56,000-63,000
DISPOSAL			
Landfill	(500 acres)	30,000-50,000	3,000-5,000
Site Development		50,000	5,000
Building	1	30,000	3,000
Scales	1	15,000	1,500
Crawler/Dozer	2	120,000	12,000
Wheel/Loader	2	120,000	12,000
Scraper (25 cu.yd.)	1	100,000	10,000
TOTAL INVESTMENT		$2,310,000-2,365,000	
TOTAL ANNUAL COST			$389,000-398,000
TOTAL INVESTMENT PER TON DAILY CAPACITY		$4,620-4,730	
OPTION 2: Shredding/Landfill			
COLLECTION			
Trucks	52	$1,300,000	$260,000
PROCESSING			
Shredder		700,000-800,000	35,000-40,000
TRANSFER			
Tractor-Trailer Sets	6-7	210,000-245,000	42,000-49,000
DISPOSAL			
Site Development		30,000-50,000	3,000-5,000
Building	1	30,000	3,000
Crawler/Dozer	3	180,000	18,000
TOTAL INVESTMENT		$2,450,000-2,605,000	
TOTAL ANNUAL COST			$361,000-375,000
TOTAL INVESTMENT PER TON DAILY CAPACITY		$4,900-5,210	
OPTION 3: Incineration/Landfill			
COLLECTION			
Trucks	52	$1,300,000	$260,000
PROCESSING			
Incinerator		7,200,000	360,000
TRANSFER			
Dump Trucks	2	40,000	8,000
DISPOSAL			
Site Development		10,000	1,000
Crawler/Dozer	1	30,000-40,000	3,000-4,000
TOTAL INVESTMENT		$8,580,000-8,590,000	
TOTAL ANNUAL COST			$632,000-633,000
TOTAL INVESTMENT PER TON DAILY CAPACITY		$17,160-17,180	

[1] Excludes cost of land.
[2] Annual Cost = Capital cost ÷ useful life

Figure III-7

HYPOTHETICAL SOLID WASTE SYSTEM

Case 4

POPULATION 500,000

SOLID WASTE GENERATION 1,000 Tons/Day

Facilities & Equipment	Number	Initial Capital Cost[1]	Annual Capital Cost[2]
OPTION 1: Simple Sanitary Landfill (No Processing)			
COLLECTION			
Trucks	104	$2,604,000	$520,800
TRANSFER			
Site Dev.		30,000	5,000
Building	2	300,000	50,000
Scales	2	30,000	3,000
Wheel Loader	2	60,000	6,000
Tractor-Trailer Sets	17-18	595,000-630,000	119,000-126,000
DISPOSAL			
Landfill (1,000 acres)			
Site Development		50,000-75,000	5,000-7,500
Building	1	30,000	3,000
Scales	1	15,000	1,500
Crawler/Dozer	3	180,000	18,000
Wheel/Loader	2	140,000	14,000
Scraper (25 cu.yd.)	2	200,000	20,000
TOTAL INVESTMENT		$4,454,000-4,514,000	
TOTAL ANNUAL COST			$765,300-774,800
TOTAL INVESTMENT PER TON DAILY CAPACITY		$4,454-4,514	
OPTION 2: Shredding/Landfill			
COLLECTION			
Trucks	104	$2,604,000	$520,800
PROCESSING			
Shredder		1,100,000-1,500,000	55,000-75,000
TRANSFER			
Tractor-Trailer Sets	12-13	420,000-455,000	84,000-91,000
DISPOSAL			
Site Development		50,000-75,000	5,000-7,500
Building	1	30,000	3,000
Crawler/Dozer	5	300,000	30,000
TOTAL INVESTMENT		$4,504,000-4,964,000	
TOTAL ANNUAL COST			$697,800-727,300
TOTAL INVESTMENT PER TON DAILY CAPACITY		$4,504-4,964	
OPTION 3: Incineration/Landfill			
COLLECTION			
Trucks	104	$2,604,000	$520,800
PROCESSING			
Incinerator		15,000,000	750,000
TRANSFER			
Dump Trucks	4	80,000	16,000
DISPOSAL			
Site Development		20,000	2,000
Crawler/Dozer	2	60,000-80,000	6,000-8,000
TOTAL INVESTMENT		$17,764,000-17,784,000	
TOTAL ANNUAL COST			$1,294,800-1,296,800
TOTAL INVESTMENT PER TON DAILY CAPACITY		$17,764-17,784	

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[1] Excludes cost of land.

[2] Annual Cost = Capital cost ÷ useful life

System Trends

In the past seven or eight years, public and legislative concern about the "solid waste problem" has increased dramatically. As environmental legislation is passed, setting minimum operating standards, capital and operating costs of many disposal systems increase significantly. Some installations have become technically or economically infeasible.

For example: the Federal Clean Air Act of 1967 set particulate emission standards which are being violated by 70% of the municipal refuse incinerators in the country. This act also prohibited the open burning of solid wastes, a common method of disposal in the country at that time.

The Federal Water Pollution Control Act of 1970 made it necessary for a majority of municipalities to install (or upgrade) quench-water treatment systems in their incinerators, or to close them down. This bill also focused considerable attention on the leachate problems that are endemic to most landfilling operations. The gravity of the leachate problem is still being evaluated.

Finally, passage of the Solid Waste Disposal Act of 1965 and its amended version, the Resource Recovery Act of 1970, encouraged most states to pass legislation specifically directed at solid waste operations. Forty-seven states have already passed solid waste legislation. In a majority of the states, open dumping is now illegal.

Equipment Investment Patterns

There have been two outstanding results of this legislation: (1) some 16,000 out of a total estimated 17,500 municipal landfill sites have been categorized as substandard;[1] and (2) an estimated 70 percent of some 250 incinerators are operating in violation of air pollution standards.[2] To meet federal and state standards, many areas have had to invest substantial sums of money in new equipment, additional site development, leachate and methane control devices at landfills, and electrostatic precipitators or wet scrubbers for incinerators. These investments would probably not have been made had not legislation and public concern forced compliance with minimum operating standards.

Some areas have chosen to replace existing facilities with entirely different systems. An EPA survey[3] indicated that only 193 incinerators were still operational in May 1972 as compared to 250 in 1967. That this trend is continuing is supported by our own research: only 104 refuse incinerators of over 50-ton-per-day capacity were operational in February 1973[4]

Solid waste legislation has also been a factor in determining which types of solid waste disposal systems are being funded. As the movement toward stricter standards continues to grown, communities have an incentive to invest in solid waste treatment systems which involve the least amount of technical risk. Uncertainty about the technical feasibility and the cost of sophisticated treatment methods for air and water pollution control has definitely reduced new investment in incinerators. Since 1967, the number of new municipal refuse incinerators built annually has declined to 4 per year, in comparison to 13 per year for the 1945-67 period.[1]

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[1] The American Society of Civil Engineers defines a sanitary landfill as "a method of disposing of refuse on land without creating nuisances or hazards to public health or safety, utilizing the principles of engineering to confine the refuse to the smallest practical area, to reduce it to the smallest practical volume, and to cover it with a layer of earth at the conclusion of each day's operation, or at such more frequent intervals as may be necessary." (ASCE manuals of engineering practice no. 39; sanitary landfill. New York, 1959. p.1.)

[2] These are 1969 figures, from Arthur D. Little, Inc. Systems study of air pollution from municipal incineration. 3 v. Cambridge, Mass., 1970. 920 p. (Distributed by National Technical Information Service, Springfield, Va., as PB 192 378, PB 192 379, and PB 192 380.)

[3] Achinger, W. C., and R. L. Baker. Environmental assessment of municipal-scale incinerators. Environmental Protection Publication SW-111. [Cincinnati], U.S. Environmental Protection Agency, 1973. 31 p. [Open-file report, restricted distribution.]

[4] Telephone interviews with solid waste management offices in all fifty states.

As a result of Mission 5000, various state programs, and other public relations efforts, some 3,155 dumps have been closed or converted to sanitary landfills since 1967.[2]

To evaluate these investment patterns correctly, it is important to remember the characteristics of rural versus urban solid waste systems. Before the passage of the three federal anti-pollution acts, most rural areas had no solid waste services at all, or were operating open dumps. Since that time, many of these areas have upgraded their operations and have invested capital in solid waste, often for the first time. As mentioned earlier, this capital has been used almost exclusively for collection trucks and sanitary landfill equipment.

On the other hand, even though some urban cities of over 100,000 people have recently replaced incinerators or composting plants with sanitary landfills, a considerably larger number are seriously in need of technologies for effective solid waste volume-reduction. This need increases as land for fill sites becomes more expensive, and more difficult to find or to purchase. Even where landfilling is now an option in urban areas, refuse must often be transported over long distances. This can increase operating costs dramatically. With the exception of areas able to legislate home separation, most urban cities will eventually require refuse processing equipment. In fact, many cities are exploring alternatives of this sort; some have reached the negotiating stage; and some have already taken action.[3]

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[1] Arthur D. Little, Inc. Systems study of air pollution from municipal incineration. 3 v. Cambridge, Mass., 1970. 920 p. (Distributed by National Technical Information Service, Springfield, Va., as PB 192 378, PB 192 379, and PB 192 380.)

[2] Correspondence with Mission 5000, Environmental Protection Agency, Cincinnati, Ohio.

[3] See the following case studies: Braintree, Massachusetts; Harrisburg, Pennsylvania; Nashville, Tennessee; New Orleans, Louisiana; New York, New York.

Processing and/or disposal methods developed to meet this pressing urban need will have to satisfy a number of criteria. First, they must meet air, water, and noise pollution standards that have already been set or that may be set in the foreseeable future. Systems will have to achieve significant volume reduction ratios; (e.g., 85-90 percent); they will have to be environmentally acceptable; and they will have to achieve these goals at a cost that can be handled by most communities.

At the present time, there are some system components in operation that achieve volume reduction with some degree of efficiency. These include conventional incinerators with or without steam recovery; refuse balers; composting plants; and refuse shredders. Two factors have limited the impact of existing volume-reduction installations, however. First, the total number of installations now in operation is extremely small relative to the need. More importantly, these particular technologies have not satisfied all federal and state standards. For example, air and water pollution is still a serious problem with refuse incinerators. In addition, the incidence of resource recovery at existing incinerator installations has been minimal.

Shredding and baling have the potential of reducing the volume of solid wastes by a factor of 1.5 and 2 respectively.[1] To achieve resource recovery of substantial volume reduction, shredding would always need to be followed by additional processing. Baling makes additional processing impossible because of the extremely high density of the refuse bales. Composting plants have been constructed in eighteen cities since 1950. All but two have since been closed for economic reasons or because of complaints over objectionable odors.

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[1] These reduction factors compare the density of shredded or baled refuse with that of unprocessed refuse in the landfill.

System Directions

There is still an enormous gap between the solid waste disposal needs of urban communities and the capabilities of existing systems. In response to these needs, the federal government, industry associations, and private companies have launched research and development programs. The following is a partial list of the systems currently being developed, tested, or operated in pilot plants.

- Pyrolysis.
- High-temperature incineration.
- Mechanical automated separation.
- Bio-oxidation.
- Fluidized bed incineration.
- Combinations of the above.

These new systems share an important characteristic: they all involve expenditure of large amounts of capital per ton capacity. Figure III-8 indicates the approximate capital requirements that are likely to be associated with these systems. One can see from the figures on investment per ton of daily capacity that the incremental increase over sanitary landfilling is substantial. (See Figures III-4 through III-7.)

In many areas, this large incremental increase in capital investment requirements combined with the broader national goal of resource conservation may mean that these systems will have to achieve some form of resource recovery. Thus revenues from the sale of these recovered resources can be used to offset the higher per ton owning and operating costs. To date, efforts at resource recovery have been minimal - chiefly limited to steam recovery, magnetic separation of ferrous metals, and production of compost.

Another salient characteristic of these systems is that all are presently classified as "new technology systems." In other words, the technological as well as the economic risk involved in these methods has not yet been determined with any degree of certainty.

Figure III-8

Capital Costs of Solid Waste Developmental Systems*

	Investment per ton of daily capacity +
Pyrolysis (Monsanto Enviro-Chem)	$15,000
High Temperature Incineration (Melt-Zit, American Thermogen)	$15,000 - $12,500
Mechanical Automated Separation (Black Clawson)	$15,000
Bio-oxidation (Fedway - Strobel and Rongved)	$10,000
Fluidized Bed Incineration (CPU-400)	$10,000-$11,000

* Based exclusively on manufacturers' estimates

+ Exclusive of land and site development costs

Capital Investment Forecast

In light of the previously mentioned trends towards more capital intensive solid waste systems, an approximate projection of the aggregate capital requirements for the next ten years was made. The projections cover only processing and disposal equipment.

Because of a lack of existing data on which to base future expenditures, RPA had to develop its own case material. The methodology for data collection included:

- telephone discussions with regional EPA officials and solid waste directors and/or planners in all fifty states;
- personal interviews with solid waste directors and/or planners in thirteen states; and,
- examination of reports which surveyed numbers of existing facilities.

During the discussions with state officials, each was asked to provide an estimate of municipal investment in solid waste for the next ten years. In only fifteen states was this information available. For the remaining states it became necessary to request certain population information, which when combined with per capita capital investment figures, could be translated into solid waste investment requirements. This calculation was performed by separating state population into the following four groups:

Group 1 - Population served by an inadequate landfill.

Group 2 - Population served by an inadequate capital intensive system.

Group 3 - Population served by an adequate sanitary landfill.

Group 4 - Population served by an adequate capital intensive system.

Investment requirements could then be calculated by multiplying each population category by per capita capital costs developed in Figures III-3 through III-8.

To project the base level investment into the future three investment levels were developed:

Level I - Assumes that investment will be made in accordance with current state plans for Groups 1 and 2 and no additional investment will be made for Groups 3 and 4. This forecast was based on state estimates, landfill and capital intensive system costs from Figures III-3 to III-8 and state population estimates.

Level II - Assumes that Group 1 will be served by a processing and disposal systems such as incineration rather than a landfill. The remaining groups invest as in Level I. This forecast was obtained by multiplying the Group 1 population by the per capita investment required.[1]

Level III - Assumes that investment will be identical to Level II except that Group 3 will be served by processing and disposal systems such as incineration rather than landfills. This forecast was obtained by multiplying Group 3 population by the per capita investment required.[2]

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[1] For the purpose of the forecast, the cost of $15,000 per ton of capacity was used increasing over the ten-year period to $20,000 per ton of capacity. These figures were based on processing/disposal costs in Figure III-7, page 33 and Figure III-3, page 28 was used to estimate the ten-year cost trend.

[2] The same approach as footnote 1 except that the $20,000 per ton of capacity cost is used because the investment is estimated to occur in the later part of the ten-year period.

Figure III-9 presents the national investment required for the ten-year period for each combination of systems investment. Figure III-10 presents this data on a state-by-state basis.

It should be noted that these projections do not include expected investment in rolling stock, which at present levels substantially exceeds investment in processing and disposal equipment. It is estimated that some 90,000 collection trucks were in service in 1971 of which about 48,000 performed residential collection services.[1] In order to maintain this level of service, the fleet replacement cost over the ten-year period was roughly 5 billion dollars.

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[1] Based on data supplied by the Environmental Protection Agency, Office of Solid Waste Management Programs and Applied Management Sciences, Silver Spring, Maryland.

Figure III-9

CAPITAL INVESTMENT FORECAST FOR PROCESSING AND DISPOSAL EQUIPMENT
1973-1983
NATIONAL SUMMARY

Investment Level	1973-1983 Expenditure ($000)
Level I:	
Group 1	257,960
Group 2	714,500
Group 3	0
Group 4	0
Total Level I	972,460
Level II:	
Group 1	2,745,050
Group 2	714,500
Group 3	0
Group 4	0
Total Level II	3,459,550
Level III:	
Group 1	2,745,050
Group 2	714,500
Group 3	3,729,400
Group 4	0
Total Level III	7,188,950

Figure III-10

CAPITAL INVESTMENT FORECAST FOR
PROCESSING AND DISPOSAL SYSTEMS
1973-1983
STATE SUMMARY

	Population (000)	Investment Level ($000)		
		I	II	III
Alabama				
Group 1	500	1,300	17,500	17,500
2	-	-	-	-
3	2,950	-	-	118,000
4	-	-	-	-
Total	3,450	1,300	17,500	135,500
Alaska				
Group 1	150	400	5,250	5,250
2	150	4,500	4,500	4,500
3	-	-	-	-
4	-	-	-	-
Total	300	4,900	9,750	9,750
Arizona				
Group 1	400	680	14,000	14,000
2	-	-	-	-
3	1,350	-	-	54,000
4	-	-	-	-
Total	1,750	680	14,000	68,000
Arkansas				
Group 1	1,500	3,900	52,500	52,500
2	-	-	-	-
3	450	-	-	18,000
4	-	-	-	-
Total	1,950	3,900	52,500	70,500
California				
Group 1	5,000	10,000	175,000	175,000
2	-	-	-	-
3	15,000	-	-	600,000
4	-	-	-	-
Total	20,000	10,000	175,000	775,000
Colorado				
Group 1	1,000	5,000	35,000	35,000
2	-	-	-	-
3	1,200	-	-	48,000
4	-	-	-	-
Total	2,200	5,000	35,000	83,000
Connecticut				
Group 1	-	-	-	-
2	3,000	200,000	200,000	200,000
3	-	-	-	-
4	-	-	-	-
Total	3,000	200,000	200,000	200,000

Figure III-10 (Continued)

	Population (000)	Investment Level ($000)		
		I	II	III
Delaware				
Group 1	-	-	-	-
2	540	9,000	9,000	9,000
3	-	-	-	-
4	-	-	-	-
Total	540	9,000	9,000	9,000
Washington, D. C.				
Group 1	-	-	-	-
2	1,000	26,000	26,000	26,000
3	-	-	-	-
4	-	-	-	-
Total	1,000	26,000	26,000	26,000
Florida				
Group 1	-	-	-	-
2	3,000	75,000	75,000	75,000
3	2,925	-	-	117,000
4	875	-	-	-
Total	6,800	75,000	75,000	192,000
Georgia				
Group 1	4,500	10,000	157,500	157,000
2	500	20,000	20,000	20,000
3	-	-	-	-
4	-	-	-	-
Total	5,000	30,000	177,500	177,500
Hawaii				
Group 1	-	-	-	-
2	-	-	-	-
3	645	-	-	25,800
4	105	-	-	-
Total	750	-	-	25,800
Idaho				
Group 1	450	1,100	15,750	15,750
2	-	-	-	-
3	250	-	-	10,000
4	-	-	-	-
Total	700	1,100	15,750	25,750
Illinois				
Group 1	5,000	10,000	175,000	175,000
2	3,400	40,000	40,000	40,000
3	1,350	-	-	54,000
4	1,350	-	-	-
Total	11,100	50,000	215,000	269,000
Indiana				
Group 1	2,500	4,500	87,500	87,500
2	-	-	-	-
3	2,680	-	-	107,200
4	20	-	-	-
Total	5,200	4,500	87,500	194,700

Figure III-10 (Continued)

	Population (000)	Investment Level ($000)		
		I	II	III
Iowa				
Group 1	2,500	5,000	87,500	87,500
2	-	-	-	-
3	300	-	-	12,000
4	-	-	-	-
Total	2,800	5,000	87,500	99,500
Kansas				
Group 1	2,000	5,000	70,000	70,000
2	-	-	-	-
3	250	-	-	10,000
4	-	-	-	-
Total	2,250	5,000	70,000	80,000
Kentucky				
Group 1	1,800	9,000	63,000	63,000
2	-	-	-	-
3	1,140	-	-	45,600
4	260	-	-	-
Total	3,200	9,000	63,000	108,600
Louisianna				
Group 1	2,300	3,200	80,500	80,500
2	600	20,000	20,000	20,000
3	470	-	-	18,800
4	280	-	-	-
Total	3,650	23,200	100,500	119,300
Maine				
Group 1	1,000	2,500	35,000	35,000
2	-	-	-	-
3	-	-	-	-
4	-	-	-	-
Total	1,000	2,500	35,000	35,000
Maryland				
Group 1	2,000	17,000	70,000	70,000
2	-	-	-	-
3	1,460	-	-	58,400
4	440	-	-	-
Total	3,900	17,000	70,000	128,400
Massachusetts				
Group 1	-	-	-	-
2	2,000	60,000	60,000	60,000
3	3,100	-	-	124,000
4	600	-	-	-
Total	5,700	60,000	60,000	184,000
Michigan				
Group 1	3,000	9,000	105,000	105,000
2	-	-	-	-
3	5,620	-	-	224,800
4	280	-	-	-
Total	8,900	9,000	105,000	329,800

Figure III-10 (Continued)

	Population (000)	Investment Level ($000)		
		I	II	III
Minnesota				
Group 1	1,000	3,600	35,000	35,000
2	-	-	-	-
3	2,800	-	-	112,000
4	-	-	-	-
Total	3,800	3,600	35,000	147,000
Mississippi				
Group 1	1,750	4,000	61,250	61,250
2	-	-	-	-
3	450	-	-	18,000
4	-	-	-	-
Total	2,200	4,000	61,250	79,250
Missouri				
Group 1	3,000	8,300	105,000	105,000
2	1,000	5,000	5,000	5,000
3	520	-	-	20,800
4	180	-	-	-
Total	4,700	13,300	110,000	130,800
Montana				
Group 1	300	1,000	10,500	10,500
2	-	-	-	-
3	400	-	-	16,000
4	-	-	-	-
Total	700	1,000	10,500	26,500
Nebraska				
Group 1	1,200	1,400	42,000	42,000
2	-	-	-	-
3	300	-	-	12,000
4	-	-	-	-
Total	1,500	1,400	42,000	54,000
Nevada				
Group 1	150	180	5,250	5,250
2	-	-	-	-
3	350	-	-	14,000
4	-	-	-	-
Total	500	180	5,250	19,250
New Hampshire				
Group 1	500	4,300	17,500	17,500
2	-	-	-	-
3	220	-	-	8,800
4	30	-	-	-
Total	750	4,300	17,500	26,300
New Jersey				
Group 1	700	1,400	24,500	24,500
2	-	-	-	-
3	6,315	-	-	252,600
4	135	-	-	-
Total	7,150	1,400	24,500	277,100

Figure III-10 (Continued)

	Population (000)	Investment Level ($000)		
		I	II	III
New Mexico				
Group 1	330	10,000	11,550	11,550
2	-	-	-	-
3	670	-	-	26,800
4	-	-	-	-
Total	1,000	10,000	11,550	38,350
New York				
Group 1	3,000	5,000	105,000	105,000
2	5,000	245,000	245,000	245,000
3	6,960	-	-	278,000
4	3,300	-	-	-
Total	18,250	250,000	350,000	628,000
North Carolina				
Group 1	2,500	5,000	87,500	87,500
2	-	-	-	-
3	2,600	-	-	104,000
4	-	-	-	-
Total	5,100	5,000	87,500	191,500
North Dakota				
Group 1	300	2,300	10,500	10,500
2	-	-	-	-
3	300	-	-	12,000
4	-	-	-	-
Total	600	2,300	10,500	22,500
Ohio				
Group 1	1,000	4,000	35,000	35,000
2	1,000	6,000	6,000	6,000
3	7,890	-	-	315,600
4	760	-	-	-
Total	10,650	10,000	41,000	356,600
Oklahoma				
Group 1	1,000	2,500	35,000	35,000
2	-	-	-	-
3	1,550	-	-	62,000
4	-	-	-	-
Total	2,550	2,500	35,000	97,000
Oregon				
Group 1	400	2,000	14,000	14,000
2	-	-	-	-
3	1,700	-	-	68,000
4	-	-	-	-
Total	2,100	2,000	14,000	82,000
Pennsylvania				
Group 1	9,000	20,000	315,000	315,000
2	-	-	-	-
3	2,020	-	-	80,800
4	780	-	-	-
Total	11,800	20,000	315,000	395,800

Figure III-10 (Continued)

	Population (000)	Investment Level ($000)		
		I	II	III
Rhode Island				
Group 1	950	1,000	33,250	33,250
2	-	-	-	-
3	-	-	-	-
4	-	-	-	-
Total	950	1,000	33,250	33,250
South Carolina				
Group 1	650	2,300	22,750	22,750
2	-	-	-	-
3	1,950	-	-	78,000
4	-	-	-	-
Total	2,600	2,300	22,750	100,750
South Dakota				
Group 1	600	1,500	21,000	21,000
2	-	-	-	-
3	50	-	-	2,000
4	-	-	-	-
Total	650	1,500	21,000	23,000
Tennessee				
Group 1	2,000	3,800	70,000	70,000
2	-	-	-	-
3	1,900	-	-	76,000
4	-	-	-	-
Total	3,900	3,800	70,000	146,000
Texas				
Group 1	6,000	15,000	210,000	210,000
2	-	-	-	-
3	5,035	-	-	201,400
4	165	-	-	-
Total	11,200	15,000	210,000	411,400
Utah				
Group 1	1,000	7,500	35,000	35,000
2	-	-	-	-
3	25	-	-	1,000
4	25	-	-	-
Total	1,050	7,500	35,000	36,000
Vermont				
Group 1	-	-	-	-
2	400	3,000	3,000	3,000
3	-	-	-	-
4	-	-	-	-
Total	400	3,000	3,000	3,000
Virginia				
Group 1	1,200	4,000	42,000	42,000
2	-	-	-	-
3	3,150	-	-	126,000
4	300	-	-	-
Total	4,650	4,000	42,000	168,000

Figure III-10 (Continued)

	Population (000)	Investment Level ($000)		
		I	II	III
Washington				
Group 1	3,000	30,000	105,000	105,000
2	-	-	-	-
3	400	-	-	16,000
4	-	-	-	-
Total	3,400	30,000	105,000	121,000
W. Virginia				
Group 1	1,200	20,000	42,000	42,000
2	-	-	-	-
3	550	-	-	22,000
4	-	-	-	-
Total	1,750	20,000	42,000	64,000
Wisconsin				
Group 1	-	-	-	-
2	500	1,000	1,000	1,000
3	3,750	-	-	150,000
4	150	-	-	-
Total	4,400	1,000	1,000	151,000
Wyoming				
Group 1	100	300	3,500	3,500
2	-	-	-	-
3	250	-	-	10,000
4	-	-	-	-
Total	350	300	3,500	13,500

FIGURE III - 11

Assumptions used to compute system costs in Figures III-4, III-5, III-6, III-7.

General

Per capita waste generation rate = 4 lbs. per day

Collection

1. Residential only via 25 cubic yard rear packer trucks
2. Twice per week curb side service
3. Cost of truck = $25,000
4. Pick-ups per hour = 85
5. One pick-up = one household = 3.2 persons (1970 Census)
6. One 8 hour shift per day: 6 hours for pick-ups, 2 hours for transportation and unloading of refuse

Transfer

1. Open top - non-compacting trailers
2. Cost of tractor-trailer set = $40,000
3. Capacity of trailer = 75 cubic yards
4. Average distance from refuse pick-up point to transfer station = 5 miles
5. Average distance from transfer station to land-fill site = 15 miles
6. One tractor-trailer set for every 6 collection trucks
7. One station for every incremental 500 tons per day of refuse
8. Transfer used when average collection truck haul distance exceeds 10 miles (Cases assume this would not be true in communities of less than 250,000)

FIGURE III-11 (Continued)

Landfill

1. One scalehouse/office per site
2. Site development costs include clearning, fence construction, soil sampling, preparation of drainage ditches, and minimal road surfacing

Incineration

1. One dump truck per 250 tons of incoming refuse to haul resulting residue
2. Site development costs include fence construction, and minimal clearing to obtain access to dump area
3. All transfer and weighing performed at incinerator facility

Shredding

1. Open top trailers used to haul shredded refuse
2. No daily earth cover required - reduced landfill equipment requirement
3. All transfer and weighing performed at shredding facility

IV. FINANCIAL MECHANISMS/TRADITIONAL ALTERNATIVES

Descriptive Analysis

Municipal capital financing of solid waste processing and disposal systems has traditionally taken place in the context of overall community planning and financing. Interviews with investment advisors, municipal legal advisors and community financial officers reveal that a municipality's solid waste system is only one of the many programs competing for operating and capital funds. Thus, any description and evaluation of financing alternatives must be presented as part of a larger picture.

This is not to say that solid waste systems are never independently financed. However, even in those cases when a separate bond issue is used for processing or disposal facilities, it is usually developed and authorized within the normal framework for municipal decision-making.

Municipalities commonly use three basic methods to obtain financing for capital facilities and equipment. The first is: borrowing funds to pay for construction or to purchase equipment. The economic justification for borrowing money to finance capital improvements is simply this: if a facility will provide a service now and into the future, it should be paid for by those people who will receive the benefits. In other words, the project may be viewed as a community investment. Ideally, the flow of receipts from the service should match the payments for the investment. Borrowing, and establishing a pay-back period roughly equivalent to the life of the facility, allows the community to accomplish this objective.

The second method for obtaining capital equipment involves the use of current revenues. This technique, of course, raises serious questions of equity, since future citizens of a community will receive benefits at no cost. However, a community may feel that the cost of borrowing capital, and the problems of matching the repayment of funds with the provision of service make borrowing an unattractive alternative. In that case, if the community expects approximately uniform expenditures each year that the system is in operation, the pay-as-you-go method may seem attractive. Needless to say, this rationale breaks down if a disproportionately large amount of capital funds is required some years.

Finally, the third alternative is to allow someone else to fund the capital project and to levy charges for service. This approach relieves the municipality of raising capital, and presumably provides the most long-run flexibility. Of course, then the problem becomes one of finding someone else to provide the desired level of service at an attractive price. For very capital-intensive projects, this may take a rather long time especially if the technology is uncertain. Financing is often a problem if the proposed contractor/operator is either small or unwilling to pledge full corporate credit to the project.

Municipal Borrowing

A wide range of borrowing methods exists for those communities that choose this alternative, ranging from relatively short-term bank notes to 30-year municipal bonds. Each of these mechanisms can be modified to fit special characteristics of the project or the borrower. For example, loans can be secured for equipment if it is relatively mobile and can be resold should repayment problems arise. Or, a community can borrow a substantial amount of capital from a bank for a short period, in anticipation of a future bond issue. The four major categories of municipal borrowing that will be discussed in this section are: medium-term bank loans, general obligation bonds, municipal revenue bonds and leasing. The choice of one particular mechanism will depend on a variety of factors. In making a decision, a municipality will often rely on the advice of outside financial experts.

Financial Institutions

Before discussing the specific characteristics of each financing mechanism, it is useful to outline the role of those parties outside the municipal government who may become involved in the capital formation process. The exact role played by each party is a direct function of the type of borrowing method that is to be employed.

Financial Consultants

Frequently, an outside financial consultant will assist the municipality in choosing a particular financing mechanism or the specific variations most suited to the circumstances. This task may be performed by independent consultants, commercial banks, attorneys, engineers, accounting firms, or investment banking firms.

Sometimes an outside party is asked to wear two hats, e.g., (1) financial advisor and (2) underwriter. When this occurs, it may be difficult to provide completely objective analysis since the underwriter/financial advisor stands to realize greater fees by recommending certain types of financing mechanisms. Many regional investment bankers make a practice of calling on municipal officials within their localities on a routine basis, in order to become involved in the financial decision-making process as early as possible. They hope to persuade the municipality to use a negotiated underwriting (in those states where this is legal) with their own firms serving as underwriter.

One example where something less than completely objective advice was provided involved a large county planning to finance a new disposal system with a revenue bond. Here the investment banker/financial advisor attempted to dissuade the county from participating in a state Environmental Bond Bank--which the county estimated would save them over 1 percent in interest costs. The firm also urged the county to use a negotiated issue--even though the bond size is to be nearly $7 million and could be expected to attract a good deal of interest from underwriters. Fortunately, the county planners seem knowledgeable enough to evaluate the full range of options on their own. They are pursuing the bond bank idea and should this fail, they plan to use competitive underwriting.

A financial consultant is often hired to help a municipality to prepare its bond offering, if this mechanism is chosen. This means gathering all necessary data, preparing the bond circular, advising on timing and marketing methods, and recommending bond terms (e.g., maturity schedules, interest payment dates, call features and bidding limitations). In a competitive offering, several underwriters are invited to submit sealed bids, with the variable being the effective interest rate. The municipality must in this case do its own preparatory work or hire a financial consultant. For a negotiated offering, most of this work is done by the investment banker. In many small or medium-size cities, no municipal official has the degree of specialized financial knowledge required for this task. An outside financial advisor is then a necessity.

There are many different ways to compensate a financial consultant, primarily because there are many different kinds of institutions that offer financial services. When an independent firm or individual is hired, the charges will generally be a direct function of time spent. If the consultant is to perform a further role in the offering (such as underwriting, in the case of an investment banker), it is not unusual for the municipality to pay no direct fee for the financial service. In this case, the consulting fee is simply buried in the other charges, such as the underwriting commission.[1]

Investment Banking Firms

The role played by the investment banking firm, insofar as interaction with a community is concerned, is rather straightforward. His function is simply as a financial intermediary who purchases bonds from the issuing city or other governmental unit and, in turn, sells them to the ultimate investor. The underwriter both assumes the market risk of price fluctuations during this period and fulfills a distribution function.

The investment banking community's contact with a municipality depends on whether or not the bond underwriting is to be a competitive or a negotiated bid. If competitive, it is not unusual for an underwriting syndicate to submit a bid without any direct contact with the municipality. On the other hand, when the municipality chooses to negotiate the underwriting, the investment banker acts as a financial consultant.

An investment banker charges a fee which is a percentage of the total bond underwriting. This fee can vary, of course, but on small or medium-sized issues, 2 percent of the total issue is a common rate.

Bond Counsel

Another party to work for the municipality during the process of bringing a bond to the capital marketplace is the bond counsel. His main role is to render an opinion regarding the validity of a bond offering. This legal opinion is required on virtually all municipal bond issues. The counsel must determine whether the bond issue is in compliance with all constitutional, statutory and charter provisions applicable to the municipality issuing the bond. The fee charged by the bond counsel, like that of a financial consultant, is a function of his time and the size and complexity of the underwriting.[1]

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[1] This is one reason that it is difficult to compare rates on negotiated and competitive offerings.

General Obligation Municipal Bonds

General obligation municipal bonds are long-term obligations secured by the "full faith and credit" of a political jurisdiction. The full-faith-and-credit pledge is based on the general revenue of the issuer, whose resources may include property taxes, sales taxes, income taxes, unincorporated business taxes, personal property taxes, taxes on gross receipts of designated businesses, license fees and other charges, grants-in-aid from the federal government, and tax-sharing distributions from the state. Interest paid on general obligation bonds is non-taxable (both state and federal).

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[1] It is somewhat misleading to present a formula that can be used to estimate a bond counsel's fee in a particular situation. In many communities, a legal firm will be on retainer to the city and the yearly fee will cover at least some of the service charges for a particular bond issue. With this caveat in mind, a "typical" fee for a medium-sized revenue bond issue ($10 million to $20 million) might be between .3 percent and .4 percent of the gross amount of the issue. Thus, charges for a $10 million issue would be between $30,000 and $40,000. For bonds smaller than $10 million, the percentage would probably be somewhat higher and, conversely, somewhat smaller for issues above $20 million. Fees for general obligation bonds are usually somewhat less than for a revenue bond of comparable size.

Uses in Solid Waste

A general obligation bond is used out of necessity when a project does not generate revenue. It is also used when a project's capital requirements are relatively modest and hence would not justify a revenue bond issue. The most important reason for using a general obligation bond, however, is that it is less expensive than any other method of raising long-term capital. The interest rate on a general obligation bond is the lowest a municipality will be able to negotiate, in the absence of an interest subsidy program.

The reason for this is that a potential bond purchaser does not have to concern himself with the projects to be financed with the bond issue. The "risk" associated with the bond is basically equivalent to the risk of the municipality as an entity going bankrupt. Even should this unlikely event occur, there is some precedence for the state providing temporary assistance, to eliminate or reduce bondholders' losses.

Primarily because of the favorable cost situation, then, a municipality frequently investigates no other financing options for the bulk of its capital projects. There are, in fact, several other valid reasons for using general obligation bonds. For example, the municipality can lump several smaller projects into one bond issue. Most general obligation bond issues are an amalgamation of many projects, because of the economies that exist in the capital formation process. Part of the transaction costs are stable no matter how large the issue, or they may vary less than proportionately as the size increases. Also, a larger issue will probably enjoy more favorable reception in the capital markets, since more syndicates may be interested in bidding. There is some evidence that the effective interest rate is inversely related to the number of bids. Larger initial issues can also be marketed more widely, to reach those institutional purchasers who prefer to take only substantial dollar amounts.

Capital for a solid waste disposal system, when raised in a general obligation bond issue, is almost always raised in conjunction with other projects. This has been the case for general obligation bonds in every city visited to date. Even in Braintree, Massachusetts, where a general obligation bond was used to finance a $2.8 million incinerator, an additional $400,000 was raised for sewer projects, and $285,000 for golf course improvements--a total bond issue of $3,435,000.

It is not inconceivable, that a municipality embarking on a project requiring very large amounts of capital (e.g., an incinerator) would use a general obligation bond for only one purpose. This would be a rarity, however. For one thing, incineration is not a commonly used system. Landfill, on the other hand, requires relatively small amounts of capital in relation to a community's overall needs. It is natural, then, to raise the money in conjunction with other projects.

This is a very important point. In discussions with investment bankers, bond counsel and city finance officers, we learned that the inclusion of a solid waste system's capital requirements in a general obligation bond issue will have absolutely no effect on the issue. Both the investment bankers and the bond buyers are only interested in the community's general financial standing, and not in the specific use of the funds to be raised. Furthermore, the intended use of the funds is not even mentioned--or perhaps only alluded to. For example, the circular for the Knoxville, Tennessee bond issue of $9.8 million indicated that $5.8 million (of which $1.4 million was for solid waste) was for "public improvements"--no further breakdown was provided. Even the Braintree, Massachusetts, bonds mentioned earlier contained no project description whatsoever. Only the single phrase, "$2,750,000 Incinerator Bonds" appeared in the circular. The DeKalb County, Georgia, $15.2 million bond issue, of which $6 million was for solid waste, was identified to prospective investors simply as "various-purpose general obligation bond issue".

Characteristics and Legal Issues

A "typical" general obligation bond will usually will be a serial bond issue: that is, the principal will be repaid periodically over the life of the issue. The longest period of maturity is usually thirty years. A "call" provision allows the municipality to repay the principal early, should market interest rates change to the point where a refinancing will save on interest charges. If this path is followed, the municipality is usually required to make a penalty payment to the bondholders.

Individual state legislative bodies and constitutions have spelled out the terms and conditions that a municipality may offer on general obligation bonds. Many states, for example, have limitations on the total amount of general obligation debt a single taxing district is allowed to issue. This limitation is frequently based on a percentage of the total assessed property values in the district. In Massachusetts, for instance, the limit is 5 percent. Occasionally, the limit is a function of the general tax revenue being raised by the community. In any case, it appears that these limitations have little impact on a municipality's ability to issue debt, since several methods for avoiding the restrictions are available.

For example, a municipality can bypass a restriction based on the taxing district's total assessed property value by adjusting the assessed values upward, since property is seldom assessed at a 100 percent valuation. A more complicated method is frequently used when large capital projects are to be financed: a revenue bond is issued with some form of long-term contract that effectively endows it with the risk attributes of a general obligation bond. (Debt ceilings seldom exist for revenue bond financing.) This tactic will be discussed at length in the section on revenue bond financing. The municipality may decide to seek approval from the state legislature to exceed the debt limit for a specific project. Malden, Massachusetts was successful in this regard when it proposed to construct an incinerator large enough to service surrounding towns.

A more important issue for a municipality is whether or not voter approval is required before a general obligation bond can be issued. In those states where certain types of bond issues require voter approval, the process of raising capital becomes more cumbersome, and methods for skirting the restrictions are often developed.[1]

Since solid waste systems are seldom financed by themselves in a general obligation bond issue, we did not find any case of a defeated bond issue for a solid waste system. While the failure of voters to approve municipal bond financing has received publicity recently, most defeated issues involve controversial financing requests, such as school construction or airport runway extensions.

The actual percentage of general obligation bonds receiving voter approval in the United States varies significantly from year to year. (The overall percentage depends to a large extent on results in large eastern states.) The record of the last three years is striking. In 1970, 60 percent of the total dollar amount of issues up for a vote was accepted. In 1971, over 65 percent of the total dollar amount was defeated. In 1972, 64 percent was accepted.[2] Included in this total approved in 1972 was Dade County, Florida's general obligation bond issue in the amount of $50 million, to be used for funding a county-wide solid waste system.

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[1] As in the case of a debt ceiling on general obligation bonds, revenue bonds with long-term contracts are often used to evade the necessity of frequent voter approval. Some states have several "classes" of bonds, some requiring voter approval and others only city council approval.

[2] Securities Industry Association. Unpublished data.

Frequency of Bond Issues

The necessity of obtaining voter approval is also an important determinant in a municipality's decision on the frequency and size of general obligation bond issues. In those states where voter approval is required, very large, infrequent bond issues are the rule. The reason for this tactic is to minimize the number of publicity campaigns that the city need undertake to raise capital. It is probably also true that most voters cannot really evaluate the large dollar amounts and the individual capital projects involved in a typical financing. Thus, the feeling in municipalities seems to be: "As long as we are asking, we might as well ask for a lot." Any effect this type of situation has on solid waste expenditures is indirect. That is, insofar as all capital intensive projects in a municipality are affected, the solid waste processing and disposal system will be affected also.

Where voter approval is not required, it is not unusual for medium and large size communities (population over 150,000) to go to the bond market quite frequently. A community groups capital projects into combined issues and tries to time the issuing date to coincide with favorable market conditions. For example, finance officers in the cities of Memphis and Knoxville, Tennessee, told us that general obligation bonds are usually issued twice yearly -- with no attempt made in the bond circular to identify projects for which the funds will be spent.

Obviously, a municipality has a tremendous amount of flexibility in this type of situation. However, the ease of raising capital, once it becomes a "habit", may induce community officials to authorize projects without relying on in-depth analysis.

Observations

The user of a general obligation municipal bond is the simplest and most flexible way for a community to raise long-term capital. The amount of funds that can be obtained with this mechanism is only limited by the ability of the municipality to raise general revenues. Only the amount of transaction costs establishes an effective minimum of about $500,000. Even at this low end, a knowledgeable financial adviser or bond counsel can minimize transaction costs by arranging a private bond placement with a bank.

It is important to emphasize here that the projects for which the funds raised from the issue are to be used do not affect the ability to raise capital with a general obligation bond. Thus, capital for a solid waste system can be obtained as easily as for any other municipal purpose if general obligation bonds are issued. Investors are concerned with the ability of the community to repay its obligations and not with the specific details of any one capital project.

Two issues remain. First, if for some reason a municipality cannot use a general obligation bond, what options for raising capital remain? And, second, since the ability to obtain capital does not mean that capital will be allocated to those projects that are "most needed", what mechanisms exist for stimulating municipalities to commit capital to certain projects -- and, specifically, solid waste systems? Both of these issues will be examined later in this section.

Municipal Revenue Bonds

Municipal revenue bonds, like general obligation bonds are long-term obligations issued directly by municipalities, authorities, or other quasi-public agencies. Unlike general obligation bonds, they do not contain a "full-faith-and-credit" clause which pledges the issuer's general tax revenue to guarantee the schedule of interest and principal payments. Rather, they pledge the net revenue generated by the project to guarantee payment of the funds obtained in the issue. Whether or not this difference is truly significant depends very much on the projected level and stability of the project's source of revenue in relation to expenses. It is important to note that the circular required for a municipal revenue bond must describe and analyze the project in detail. This is not true, of course, for a general obligation bond.

Before examining the potential sources of revenue available to a municipal project, and the concomitant effect on project risk and bond risk, it is useful to discuss the other factors that differentiate a revenue bond from a general obligation bond.

Use of Revenue Bonds

Perhaps the most interesting difference is the singularity of purpose associated with a revenue bond. Earlier, it was emphasized that most general obligation bonds are used to raise capital funds for several project simultaneously. This would never be the case in a revenue bond issue. In addition, it would be unusual to find a revenue bond used to finance anything other than a "significant" project (in terms of dollar amount). The ten instances of revenue bond financing encountered in this study were devoted specifically to solid waste projects and had an average size of $5.9 million.

As a result of the size and selective nature of revenue bonds, they are issued only irregularly. The mechanism is used only (1) when a major project, requiring long-term capital, is to be managed by an independent authority or a distinct city agency; and (2) when the service provided will generate enough revenue to operate and maintain the facility and retire the bonds.

The legal power enabling a municipal government to issue revenue bonds must come directly from the state. In many jurisdictions, the use of revenue bonds results from the legal restrictions placed on general obligation bond financing. Usually these restrictions involve a ceiling on the municipality's outstanding general obligation debt. The ceiling is based on a percentage of assessed property value. Normally, this limit does not apply to revenue bonds.

When a municipality is nearing its "ceiling" on general obligation bond debt, it may turn to a revenue bond as a means of circumventing and restriction. This rationale is even occasionally used by communities that are nowhere near their general obligation debt ceilings. They wish to retain their flexibility for future general obligation debt.

Revenue bonds are also used in many communities as a result of tradition rather than for any "practical" reason. This seems to be the case, for example, in many Pennsylvania communities. Harrisburg has a number of authorities that have been financed through revenue bonds. When a project is large enough to justify a revenue bond, and when it will provide a revenue-generating service, this financing mechanism is usually chosen. The reason given may be the limitation on general obligation debt, but the real reason is often to separate general tax revenues from project revenues. The municipal agency operating the project is often able to increase total municipal revenues by instituting a direct "service charge" for the new facility, without an offsetting decrease in municipal taxes. Apparently a new charge is less harmful politically because it gets less publicity than a raise in general taxes (which at the local level are virtually synonomous with property taxes).

Finally, revenue bonds can be used by institutions unable to use general obligation bonds because they do not have the requisite taxing power. In the area of solid waste, the organizations without taxing power are regional authorities and non-profit public corporations. These institutions were discussed in the previous chapter. It is enough to say here that since they provide essential community services, the community or communities sponsoring them will make every attempt to reduce the risk of project default and thus of bond default. This reduction in risk will translate into a reduction in interest charges, or cost of capital.

Procedures

For the most part, the institutions and procedures associated with a revenue bond issue are essentially the same as those required for general obligation financing. An investment banker and a bond counsel are always needed. If the bond is to be negotiated, the investment banker will handle all procedural requirements. Otherwise, the municipality will require either in-house expertise or the services of a financial consultant. The typical revenue bond is more likely to be negotiated (rather than thrown open for a competitive underwriting), since the added complexity of assessing the revenue and cost stream will reduce the potential number of bidders. Competition will also increase the time required between final clearance and issue date.[1]

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[1] The question of whether interest rates are higher or lower on a negotiated issue is not easily answered. Much depends on the investment banker chosen to negotiate the rate. On balance, for medium-sized or small issues (less than $20 million), negotiating the rate with a large investment banking firm is unlikely to result in higher interest rates for the bond issue.

Revenue and Risk

Finally, the primary difference between a general obligation bond and a revenue bond is in the way that revenue is generated to meet the schedule of interest charges and debt repayment. In order to meet the schedule, the project's net revenues[1] must be greater than, or equal to, the payment schedule.

The greater the probability that net revenues will exceed scheduled charges, the lower the risk of bond default. The risk of bond default has a direct effect on the bond rating and interest charges. For this reason, a municipality attempts to prepare a financial framework for its project that will maximize the probability that revenues will exceed all expenses, including repayment charges.

A typical revenue bond circular will contain a great deal of information about operating costs and estimated revenues. Usually, the municipality will hire an outside consultant to confirm its own estimates. It often takes many months to prepare an acceptable circular. This is one important factor that lengthens the time required to complete a revenue bond issue.

Many municipalities which use revenue bonds are able to maximize the probability of the project achieving a satisfactory net revenue by signing a contract or lease with the managing organization that guarantees the bond payment. This practice is especially prevalent when a city is committed to providing the service.

There are several legal methods for designing a revenue bond so that it has the risk attributes of a general obligation bond. One of the simplest was used by Harrisburg, Pennsylvania in funding an incinerator project. Here, the city government created a "paper" solid waste authority whose only function was to hold legal title to the incinerator and to be directly responsible for the bonds. The city then signed a non-cancellable contract with the authority that stipulated payments to the authority in the exact amount of the bond payment schedule. The city operates and maintains the incinerator, and it must pay the authority (and hence the bond holders), whether or not the incinerator is ever used.[1]

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[1] Net revenue in this context means gross revenue less operating and maintenance expenses.

Discussions with both the bond counsel who rendered the opinion and the investment advisor who handled the underwriting revealed that the capital markets thought of the Harrisburg Incinerator Revenue Bond as a Harrisburg General Obligation Bond. Further confirmation of this was provided by the bond rating agencies. They rated the revenue bond in the same category as the city's general obligation issues. The investment banker also indicated that the negotiated interest rate would not have been any different had the bond been a general obligation issue.

Observations

The fact that a muncipality can design a revenue bond that has the risk attributes of a general obligation bond is an extremely important comment on the methods actually used in raising capital. For, in fact, the ten "revenue" bonds examined for this study all had risk characteristics closer to those of a general obligation issue than a true revenue bond. If a municipality is willing to use this approach, it is obvious that an effective alternative to the general obligation bond will often be available if general obligation financing is impossible or impractical.

Other options also exist. Four will be discussed in the following sections. Recall, however, that no financing mechanism by itself will ensure that capital is allocated to specific projects. This requires the establishment of direct incentives by the institution desiring change.

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[1] In fact, as of this writing, the city has made several payments to the authority. The incinerator is still in the shakedown stages and has not yet burned any significant amount of refuse.

Bank Loans

The third category of municipal borrowing is the bank loan or note. This mechanism can usually be put to work much more quickly than either form of bond. However, in general, it can only be used for relatively modest amounts of capital and, except in rare instances, is of relatively short duration -- e.g., less than five years.

Most municipalities use bank loans mainly to stabilize cash flow. For example, the municipality may have a line of credit which it draws upon periodically in anticipation of tax receipts.

Occasionally, large cities use bank notes in anticipation of a bond issue. Sometimes the notes -- which can be relatively substantial if arranged with a large bank -- are "rolled over" as they expire. In this sense they provide a medium-term source of capital funds.

The use of bank notes has generally been limited to financing collection vehicles in small municipalities (less than 100,000 people). In this use, the loan is quite similar to a conventional automobile loan: it is paid back in equal installments over two or three years and the bank retains title to the equipment as collateral.

Bank loans are used occasionally to finance other types of equipment for solid waste systems in a small community, e.g., processing equipment to be used prior to landfill. These loans may be arranged by the equipment supplier, who is likely to have bank connections in a major city. An example of this occurred in Great Falls, Montana. The city was buying a shredding system from the Heil Manufacturing Company at an installed cost of $700,000. Rather than try to arrange a bond financing for this relatively small amount of money, Great Falls included a stipulation in its project specifications that each bidder be able to supply financing for five years. Heil simply arranged for its Chicago bank to provide Great Falls with the loan. Since interest on a bank loan to a municipality is tax-free to the bank, the city was charged an interest rate which compared favorably with the rate it might have been charged on a general obligation bond. This underscores the common features that different borrowing methods share.

Leasing

There is one borrowing mechanism that does not involve the immediate cash outlay required for an outright purchase: a lease agreement.

Under the lease agreement, the leasing company (the lessor) purchases and holds title to the equipment during the lease term, and the lessee pays rentals for the use of the equipment over a specified term. Lease terms rarely exceed five years.

In solid waste, lease agreements have usually been arranged by local equipment representatives who place the financing with either a bank or leasing company. Normally, interest rates on lease agreements average between 12 and 18 percent of the capital cost, with 10 percent of total cost required at the end of the term if the equipment is to be purchased.

The use of leasing for financing solid waste equipment has been extremely limited because of the high interest rates compared to other municipal sources of capital. This alternative is used only for interim financing that requires relatively small capital outlay.[1]

We only encountered one case of municipal leasing of solid waste disposal equipment in our field studies. In Memphis, Tennessee, certain pieces of landfill equipment were leased for a period of two months. At the end of the two months, a new appropriations budget was approved and the city was able to purchase the equipment.

The use of leasing by private solid waste companies on the other hand, is quite prevalent. Small private collection companies that are trying to expand their businesses may find themselves in a cash-flow bind. They use this source of financing extensively. However, even in these cases, leasing is still only considered when less expensive sources of private capital are not available.

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[1] Since lease-rental payments are not tax deductible for the lessor as bank loan interest payments are, leasing companies do not offer a reduced rate to municipalities.

Current Revenue Capital Financing

Historically, the most common method for obtaining capital equipment for use in a solid waste system has been the "pay-as-you-go" technique. This has been especially true in medium and small sized communities and even today is the most common approach to acquiring equipment.

As discussed previously, collection vehicles are relatively short-lived and are usually replaced on a scheduled basis (except when an entire system is to be replaced at one time). For example, a community might purchase enough new vehicles each year to replace one-fifth of its fleet. Money for this purpose will be budgeted from the city's general revenue receipts. Whether the collection equipment will appear in a capital or an operating budget will depend on the community's accounting system.

Processing and disposal equipment is often paid for out of current revenue for a somewhat different reason. In many areas, very little money has ever been spent for disposal equipment. Those communities with open dumps, or even marginal "sanitary" landfill operations often use little more than a bulldozer at the disposal site.[1] Needless to say, very few of these communities have transfer stations or other capital intensive processing equipment. Their capital expenditures for equipment can easily be financed out of current revenue.

Even some medium-sized municipalities use the "pay-as-you-go" mechanism to finance their solid waste systems. San Diego County, California, with over 700,000 people (excluding the city of San Diego), finances all solid waste expenditures from general revenues. The county is committed to landfill as the primary means of disposal. It requisite capital expenditures are not large in relation to the overall budget and are spread out over time.

It is interesting to note that, of the twelve "pay-as-you-go" municipalities studied, several (including Ventura County, California) were planning to use funds from federal revenue-sharing programs to finance solid waste expenditures.

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[1] As noted previously, it is estimated that over 70 percent of municipal disposal sites do not qualify as "sanitary landfills".

Observations

Municipalities that have been able to take care of solid waste disposal through the use of a sanitary landfill will be able to maintain the system efficiently by financing out of current revenues. Equipment replacement is not likely to be a major expense and can be taken care of on a periodic basis. Land can be leased or purchased as an investment.

On the other hand, municipalities requiring either an extensive upgrading of their present systems within a short period of time, or a capital intensive, e.g., incineration, solution to solid waste problems, will have to raise capital either by borrowing or by contracting with a private firm.

Private Financing of Municipal Solid Waste Systems

The third alternative for a community seeking to obtain capital equipment for use in a solid waste system is to contract with a private firm to raise the capital, purchase the equipment, and operate the system. This approach relieves the municipality entirely of having to devote capital funds to solid waste treatment, and presumably provides the most long-run flexibility, since a commitment to a specific system exists only for the length of a signed contract.

In this section, only the financial mechanisms available, and potentially available, for funding private solid waste firms will be discussed. There is strong evidence that an industry growth pattern is emerging that could lead to a much greater involvement for the private sector in the provision of solid waste treatment services.

Traditional Mechanisms

Historically, solid waste management firms have financed their businesses with one or more of the three "traditional" corporate financing mechanisms: (1) internally-generated funds; (2) debt (loans from banks or other institutions); and (3) common stock or variations. Before the emergence of large solid waste management firms, (e.g., Waste Management, Inc., and Browning-Ferris Industries), nearly all financing was accomplished through internally-generated funds and occasional local bank loans for trucks or other individual items of equipment. The equity financing for these firms came primarily from the initial cash investment of the owner(s), with occasional additions from close friends or members of the owner's family. Most of these firms were, thus, "closely-held", small businesses.

The larger solid waste management firms added a new dimension to the financing picture -- public equity. In addition to using traditional funds sources, the larger firms turned to the public for the relatively large-scale financing they needed to build their businesses (primarily through acquisitions of the smaller, closely-held firms). These are "widely-held" firms, with a broad base of public ownership holding millions of dollars worth of common stock. Browning-Ferris Industries, for example, is traded on the New York Stock Exchange.

To date, these traditional financing mechanisms have provided adequate capital for developing the type of systems that most communities have wanted to install. Privately-operated disposal has almost always taken the form of landfill. Even those transfer stations operated by private firms have usually been simple in design, and have frequently been installed on community property. All of these installations have had the common characteristics of being "low cost", in terms of initial capital required. This allowed the local firm, and often even the national firm, to raise the minimum level of requisite capital with relative ease.

Minneapolis, Minnesota provides an example of a major private investment in solid waste facilities. The city's contractor was a newly-formed firm which was capitalized with private equity funds and a bank loan. The initial capital investment of approximately $1 million covered transfer stations, tractor-trailer units and landfill equipment. The private firm posted a $2 million performance bond with the city.

Existing Mechanisms with Potential Applicability to Solid Waste

The picture for the future, however, is less clear. Capital intensive solutions to solid waste problems are becoming more popular, and perhaps more necessary. Systems such as simple incineration, incineration with resource recovery, pyrolysis, and other forms of technically advanced resource recovery options, are being discussed in many areas. The current EPA grants program, which has funded several prototype systems, is providing incentives for more technologically sophisticated systems. New Orleans, for example, needs to use more sophisticated systems because the state discourages incineration and the city's high water table limits the use of landfill.

If these systems are to be built and owned by private firms, it is possible that the routine capital financing mechanisms in use today will not suffice. Any innovative system involves much more risk than basic sanitary landfill. But during our interviews, large solid waste firms indicated their unwillingness to commit the relatively large amounts of capital necessary for construction without some assurance that the systems will work and that an adequate risk-adjusted rate of return is projected. They also expressed some doubts regarding their ability to raise the requisite capital through their normal channels.

New ventures will undoubtedly have difficulty with initial financing, not only because of the amounts of capital required, but also because of the technology involved in new approaches to solid waste disposal. So, ownership of capital intensive solid waste systems by private firms may require more widespread use of financial mechanisms that can raise the projected rate of return (or lower the cost of capital) for a given capital investment.

In addition to the financing problems of more capital intensive, technologically risky private systems, there are often legal restrictions imposed on municipalities by the state that act to deter private investment. One example, which will be discussed in more detail in the section on industrial revenue bonds, concerns restrictions on the community's ability to sign long-term contracts with a solid waste system operator. This inability to insure a long-term commitment to the project increases the private firm's risk, and may render it impossible for the firm to obtain financing at a reasonable cost.

In the rest of this section, mechanisms for increasing the flow and reducing the cost of capital funds to private firms in the solid waste field will be discussed.

Industrial Revenue Bonds

Perhaps the most easily understood new

mechanism available for assisting a private firm in financing a solid waste system is the industrial revenue bond. The basic device is issued by the municipality for or on behalf of a private enterprise. It combines important aspects of municipal and private debt financing.

Industrial revenue bonds are issued by the municipality that, technically, will own the facility or equipment to be acquired with the funds. The private corporation then leases the equipment from the municipality. The lease payments are just sufficient to allow the municipality to make scheduled payments of debt and interest. The municipality acts as a vehicle through which a corporation can obtain low cost financing. (An example of the proposed use of an industrial revenue bond is provided in the Saugus, Massachusetts case study.) If the payment arrangements between the corporation and the community are structured as an "installment sale", the corporation may claim ownership for tax purposes. This gives the corporation a tax benefit in the form of accelerated depreciation and/or the investment tax credit.

To the corporation, the most important feature of industrial revenue bonds is the tax-free interest provision, similar to that for municipal general obligations bonds. The interest rate required on these bonds may be a little higher than for general obligation bonds, however, because of an important difference in the security behind the bonds. Whereas the general obligation bond is backed by the "full faith and credit" of the issuing community, the industrial revenue bond is secured only by the assets of the corporation. It is not backed by the "full faith and credit" of the community. The credit rating of the particular corporation has a direct bearing on the cost to that corporation of an industrial revenue bond issue.

Although it is very difficult to generalize about interest rates, it is likely that the difference in interest rates for a corporation going the taxable route, as opposed to the non-taxable industrial revenue bond route, might range from 1 to 2 percent. Information available from the First

Boston Corporation[1] indicates that during the second half of 1971. municipal general obligation bonds sold at interest rates 2.45 percent lower than comparably rated corporate bonds. During the same period, industrial revenue bonds used for pollution control facilities sold at interest rates 0.66 percent higher than municipal bonds. Accordingly, during this period, the interest rate on industural revenue bonds was 1.79 percent less than the corporate rate. For a bond issue of several million dollars, this could represent a very sizable savings over the 10-to-30-year life of the bonds. (Over the life of a 20-year, $10 million issue, the total interest savings, with a 1.79 percent spread, amounts to about $3.6 million.)

The non-taxable interest provisions for industrial revenue bonds have come under extremely heavy pressure from the Treasury Department in recent years, and, in fact, many categories within this type of financing have been denied tax-free status. In the environmental area, industrial revenue bonds are tax-free for air and water pollution facilities installed by a private corporation, as long as these facilities do not "result in an increase in production or capacity, or in a material extension of the useful life of a manufacturing or production facility or a part thereof."[2]

In the solid waste area, the picture is less clear, primarily because the mechanism has received little, if any, use. Interpretations of §1.103 of the Internal Revenue Code regarding industrial revenue bonds indicate that municipal solid waste disposal facilities qualify for tax-free status, notwithstanding the fact that they operate at a profit.[3]

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[1] The First Boston Corporation. Tax exempt pollution control financing. Boston, [1972]. 55 p.

[2] Rules and Regulations pertaining to § 1.103 of the Internal Revenue Code, July 5, 1972.

[3] Rules and Regulations pertaining to § 1.103.

Discussions with officials of the Internal Revenue Service, and with members of investment banking firms who have dealt directly with the solid waste/industrial revenue bond question reveal that the administrative complexities and too broadly defined guidelines are responsible for an unduly protracted IRS review/approval process. Most projects[3] must be submitted to the IRS for a ruling before tax-free status is granted; this ruling procedure may take as long as three to six months.

The IRS is concerned with two restrictions in its ruling process.[1] The first is that the solid waste which is entering the proposed system must have no significant realizable value at the point of input. Secondly, if the IRS decides that the use of tax-free bonds will give a particular company an unfair competitive advantage in its principal line of business, it may hand down a negative ruling. If the profits from the solid waste system are incidental to the company's principal business, the project stands a better chance of approval.

The ability of a municipality to issue an industrial revenue bond is dependent on state enabling legislation. In a recent survey[2], it was found that, of 37 states which allow industrial revenue bonds, 36 allow them to be used for pollution control.

Another aspect of industrial revenue bonds concerns the need for communities to sign long-term contracts with corporations, to guarantee a minimum supply of solid waste (and a minimum profit).

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[1] Rules and Regulations pertaining to § 1.103 of the Internal Revenue Code, July 5, 1972.

[2] Revenue bonds: a low-cost incentive to clean up. Industrial Development and Manufacturers Record, 141(6):8-9, Nov./Dec. 1972.

[3] The municipal board counsel involved must determine that the issue will qualify for tax-free status. Except in obvious situations, he does this by asking the IRS for a ruling.

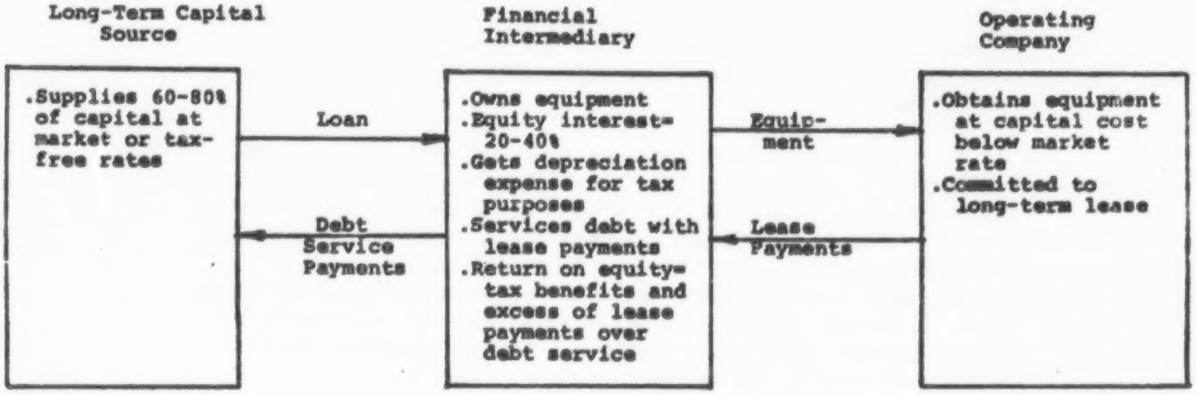
Security for these bond issues requires that long-term agreements be completed between the parties. However, many states do not permit communities to enter into long-term (e.g., 20 years) service contracts, so here, too, special legislation is required.

From the corporation's point of view, the need to provide security for the financing, in the form of long-term contracts, is a major stumbling block. In the Saugus, Massachusetts case, for example, the corporation (THESCO) wanted to negotiate twenty-year solid waste supply contracts with fifteen to twenty communities in Boston's North Shore region. Many of these communities were reluctant to commit themselves to a relatively high per ton cost for a long period of time.

Leveraged Leasing

Another potential mechanism through which a private solid waste firm might, in theory, acquire capital funds is leveraged leasing. In brief, the method operates by interposing a financial intermediary from a high tax bracket between the corporation requiring capital and the source of capital. The intermediary's main purpose is to hold legal ownership of the equipment. He is, therefore, entitled to the tax benefits of ownership, such as the investment tax credit, accelerated depreciation, and the tax-exempt status of bond interest. In short, a "tax shelter" is created for the intermediary because the operating corporation is not eligible for tax benefits. The intermediary passes on his tax savings to the corporation in the form of reduced charges for the equipment lease.

A typical leveraged-lease structure might look like this:


Long-Term Capital Source
.Supplies 60-80% of capital at market or tax-free rates
Loan
Debt Service Payments
Financial Intermediary
.Owns equipment
.Equity interest= 20-40%
.Gets depreciation expense for tax purposes
.Services debt with lease payments
.Return on equity= tax benefits and excess of lease payments over debt service
Equipment
Lease Payments
Operating Company
.Obtains equipment at capital cost below market rate
.Committed to long-term lease

The long-term debt is either guaranteed by the operating corporation, secured by a lien on the equipment, or both. The financial intermediary uses the lease payments as a source of funds for servicing the long-term debt.

In addition, the excess of lease payments over debt service provides a cash flow which is used to reduce the intermediary's equity investment. This cash flow, together with the equipment's residual value at the end of the lease -- it is usually bought by the corporation -- and the tax benefits, can provide an attractive rate of return to the intermediary.

Leveraged leasing has ordinarily been used to finance individual pieces of capital equipment, such as airplanes. More recently, several deals involving pollution abatement installations have been arranged. As mentioned earlier, no attempt to use this mechanism for financing solid waste equipment has yet been made. However, it does have potential in this area, especially if all or a portion of the long-term capital were to be raised through a tax-exempt industrial revenue bond, issued by the municipality where the equipment is to be installed.

Recently, Boston, Massachusetts requested a number of private firms to submit proposals for a new solid waste disposal system. In the request, leveraged leasing was discussed in the "financing" section of its "background data":

> Should the Corporation be unable to avail itself of the full utilization of the depreciation and investment tax credit, it may be possible, subject to State Law and the IRS rulings, to pass these benefits to a third party ... and substantially reduce the overall interest cost. This concept is generally referred to as "leveraged" leasing.

Accelerated Depreciation

Section 169 of the Internal Revenue Code provides that pollution abatement facilities may be amortized for tax purposes over a 60-month period, thereby providing significant tax write-offs for qualifying firms. If a firm chooses to use accelerated depreciation, it may not use the 7 percent investment tax credit at the same time. On the other hand, firms may choose to use regular depreciation schedules. In this case, the investment tax credit may also be used. Although circumstances vary for each firm and for each equipment installation, the use of the investment tax credit and regular depreciation will probably yield greater tax write-offs for the firm than will accelerated depreciation.

Section 169 refers specifically to air and water pollution control facilities; solid waste disposal facilities may qualify as well. Discussions with investment banking firms and the Internal Revenue Service indicate that as long as the firm is considered to be the "owner" of the facility, a favorable ruling can be anticipated. As with industrial revenue bonds, however, a rather complex IRS-ruling procedure is required.

It should be noted that accelerated depreciation (or the investment tax credit and regular depreciation) may be used in conjunction with the industrial revenue bond mechanism. These devices, which serve to lower the tax payments of the corporation, may be very important in stimulating private investment in solid waste systems.

The mechanisms available for private firms that have been discussed here are all aimed at reducing tax payments, thereby increasing after-tax profits for the firm. Thus the mechanisms are designed for firms which are now, or stand a reasonable chance of becoming, profitable. Marginal firms, either new ventures or ongoing low-profit enterprises, may not fully benefit if their pre-tax income is not sufficient to absorb the additional tax deductions. This inequity is mitigated to an extent by provisions for loss carrybacks (three years) and carryforwards (five years). Firms which are sure to benefit from these mechanisms are of two types: the enterprise which can provide a solid waste service at a profit; or, a larger corporation which operates a solid waste subsidiary on a marginal or loss basis. The parent company, in the latter case, can use the tax losses to offset income from solid waste or to "shelter" income from another, unrelated, subsidiary.

EVALUATIVE ANALYSIS

The remainder of this section will present an assessment of those financial mechanisms that have already been described in the context of their usefulness for providing investment capital for solid waste facilities and equipment. The evaluation that follows is made from the point of view of municipalities that need long-term capital.

The analysis will be presented within the framework of six major issues and criteria.

1. Complexity of application. This issue involves an analysis of the degree of difficulty in raising capital associated with the usage of each mechanism. Factors to be discussed include: an estimate of the amount of calendar time that can be expected to elapse between the initiation of a request for funds and the receipt of the funds; the amount of data that must be compiled and any indirect planning and management effects that may occur; the need for outside (consulting or legal) advice or certification, and the effect this may have on system planning; and, finally, an estimate of the degree of project evaluation that might be encouraged by a particular mechanism.

2. Ability to raise capital. This issue involves an estimate of each mechanism's efficiency in (a) raising specific dollar amounts, and (b) obtaining capital for specific kinds of projects.

3. Cost of capital. This discussion will include both the direct and indirect costs of capital that are associated with each mechanism. Not only will the interest rate be considered, but, in addition, an analysis of other costs that may be unique to a specific mechanism will be presented--costs that are often ignored in evaluating options.

4. Constraints on use. Included there will be a discussion of the legal, technical, and economic constraints associated with each mechanism.

5. Effect of subsidy level. All of the mechanisms involve an indirect and, frequently, a direct amount

of federal financial assistance. The analysis will include an estimate of the amount of solid waste investment that isstimulated by each mechanism, as well as a discussion of the potential impact that would be associated with a change in the level of the subsidy.

6. Disruptions in the solid waste system. Essentially, what will be discussed here is the effect each mechanism has on the existing public/private system mix.

The table on the following page summarizes the financial mechanism analysis.

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FINANCIAL MECHANISM EVALUATION SUMMARY

	General Obligation Bonds	Municipal Revenue Bonds	Municipal Bank Loans	Leasing	Current Revenue Capital Financing	Private Financing
Complexity of Application	. No project information required. . No project analysis required. . Short lead time.	. Most complex. . Bond circular must contain detailed economic and technical information that has been certified by outside consultants. . Requires more time to arrange.	. Less complex than bonds, particularly if community has bank "line of credit." . Very short lead time. . No need for external advice or certification.	. Relatively simple. . Minimal analysis required. . Very short lead time.	. Least complex of municipal finance alternatives.	. Problems may include: locating acceptable firm, negotiating contract, proposed facilities site, public job reductions, other organizational/management issues. . Technical and economic analysis performed by private firm.
Ability to Raise Capital	. Minimum $500,000 due to fixed transaction costs but can combine several smaller unrelated projects. . Function of community credit, not a function of particular project.	. Minimum $1,000,000 due to heavy fixed transaction/administrative costs. . In "pure" form, not suited for technologically risky projects. . Maximum is function of projected project revenues.	. Absence of heavy fixed transaction costs makes useful for smaller dollar needs. . Maximum limited by lending capacity of bank. . Better for short and medium term loans than bonds.	. Good for small short-term (5 year) loans. . Applicable to specific pieces of equipment, especially rolling stock.	. Current revenue often not available in amounts necessary for major capital expenditures.	. Depends on credit rating of firm and/or soundness of project. . Firms may be limited to smaller amounts of capital than municipality with g.o. bond.
Cost of Capital	. Lowest interest rates for long-term capital. . Interest cost 2-3% less than corporate bonds. . Indirect costs include bond counsel and possibly financial consultant, but costs are relatively low.	. Somewhat higher than general obligation bond. . Is directly related to the probability of maintaining adequate revenue. . Municipality can minimize cost of capital by giving revenue bond the risk attributes of a general obligation bond. . Indirect costs higher than for general obligation issue.	. Similar to general obligation bond, in terms of risk and security-but affected by loan size and term.	. High effective annual interest (12-18%). . Same rate for private/public lessees.	. "Opportunity" cost, other social benefits foregone.	. Higher for private firm than for municipality. . Could be lowered through mechanisms like industrial revenue bond or leveraged leasing.
Constraints on Use	. Voter approval often required. . Legal debt ceiling may exist. . Can only be used by jurisdictions with taxing powers.	. Can be used only for specific projects. . Good only for relatively large amounts of long-term capital. . Must be managed by district authority or agency. . Requires stable, long-term source of revenue.	. Shorter loan terms than bonds. . Smaller dollar amounts than bonds.	. Short term. . Small dollar amounts. . State-imposed restrictions on municipalities re: signing multi-year noncancellable leases.	. No legal constraints. . Economic constraint--amount of available capital	. Legal constraint against communities signing long-term non-cancellable contracts. . Insufficient profit potential to compensate firm for risk. . Admin./legal complexities of potential mechanisms-industrial revenue bonds and leveraged leasing. . Mechanisms available do not benefit marginal firms.
Effect of Subsidy Level	. Lowers interest rate by making interest income non-taxable to investors. . Stimulates municipal capital investment in general-not oriented to solid waste or any other specific area.	. Lowers interest rate by making interest income non-taxable to investors. . Stimulates municipal capital investment in general-not oriented to solid waste or any other specific area.	. Less than bonds because loans rarely fund major municipal investments.	. No direct federal subsidy.	. No direct federal subsidy.	. No direct subsidy unless combination municipal/private financing mechanism is used; combination lowers interest costs. . Use of industrial revenue bond or leveraged leasing will improve firm's return on investment and encourage investment.
Disruptions in Solid Waste Systems	. Deterrent to change in direction of private sector.	. Deterrent to change in direction of private sector.	. Minimal.	. Minimal.	. Minimal.	. Moves in direction of private sector involvement.

General Obligation Bonds

Complexity of Application

General obligation bonds are essentially the least complex mechanism available to a community needing long-term capital from sources other than its general revenue pool. This is so because the information requirements of the bond circular are minimal. The community pledges to pay both principal and interest from ad valorem tax revenues that can be assessed against all taxable property without limit as to rate or amount. Community officials can assuage any investor's concern about risk by describing the community's tax base, and all debt commitments. It is not unusual for a general obligation bond circular to be no longer than three or four pages. Occasionally, a more detailed description of the municipality will be included, but only for cosmetic reasons. It is unusual to include in the circular anything more than a general indication of what the proceeds will be used for.

Because of the minimal information requirements, the amount of time necessary to arrange for a general obligation issue is rather short. Actual calendar time in different jurisdictions may vary because of different legal requirements (e.g., the need for a referendum), but, essentially, the only important economic reason for delay of more than a few days or weeks is to allow more potential underwriters to become aware of the pending issue. This extra time may increase the number of bids, and , theoretically, reduce the interest cost.

Finally, the need for external advice or certification is minimized when a general obligation bond is used. Frequently, the circular can be prepared by a municipality's finance department. If not, a financial consultant can prepare one with ease. A bond attorney will be needed, but his role will also be minimal, since no unusual situations are likely to be encountered. His function is merely to confirm that the municipality has fulfilled all legal requirements for debt obligations.

Perhaps the most important fact about a general obligation bond is that prospective investors require no extensive technical or economic analysis of the proposed projects. This has its advantages and disadvantages. The advantages are clear:

- Reduced cost, since thorough technical and economic analysis is usually expensive.
- Increased flexibility since risky projects may be initiated without concern for the opinions of investors. Delays due to an in-depth risk analysis need not occur.

The offsetting disadvantage, however,is very important:

- Since a careful project evaluation is not required to obtain funding, it may never be conducted, even by a municipality's own personnel. Thus, the decision-makers may be unaware of the technical and economic risks they are asking the area's taxpayers to assume.

It becomes apparent that the minimum amount of "complexity" associated with a general obligation bond issue is not without some disadvantages to a municipality.

Ability to Raise Capital

General obligation bonds can be efficiently used to raise capital of virtually any amount above a reasonable minimum.[1] The fact that a minimum exists at all is due mainly to the existence of fixed transaction costs. These would make the per-dollar cost of small issues prohibitive. This matter of "transaction cost" has two dimensions. The first is the obvious cost to the borrower: e.g., bond counsel fees, circular preparation, and administrative time. Second is the less obvious cost to the lender. In other words, the bookkeeping expenses, investigative expenses, and minimal liquidity associated with a few bonds from one source would deter an institutional lender from purchasing a very small bond issue.

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[1] Most investment bankers generally use the figure $500,000 as the lowest amount for which a general obligation bond should be considered.

General obligation bonds can also be used efficiently to raise capital for virtually any project or combination of projects. Investors are not concerned with the use of capital when the principal and interest payments are guaranteed by the full faith and credit of the issuing community.

Another feature of this type of financing is that many projects can be grouped together into one bond issue. This makes general obligation financing ideal for most small and medium-sized communities. Smaller communities cannot be expected to float a bond issue for a solid waste system when the system's total costs fall below the minimum necessary for a bond issue. By combining the solid waste system's capital requirements with other projects, however, the community may be able to raise capital that would otherwise be impossible to obtain for the solid waste project alone. In fact, this is a very common practice. It can be argued that general obligation bonds make it possible for a community to take care of waste needs that might otherwise be neglected.

In summary, general obligation financing undoubtedly gives a municipality the most flexibility--insofar as the ability to raise capital is concerned.

Cost of Capital

General obligation bonds have the lowest interest rate obtainable among mechanisms covering financings over comparable periods of time. This is true simply because the risk of default is lower than with any other financial mechanism.

In addition, indirect costs associated with raising capital are also relatively low when general obligation financing is chosen. As noted earlier, the community can forego extensive outside technical or economic analysis,and the necessary legal and financial advice will be relatively inexpensive, since a minimum of work is required. On the other hand, if voter approval is required, the costs of holding an election must be attributed to this mechanism. The need for voter approval may delay the financing and may result in higher construction costs for the project.

Constraints on Use

Three potential constraints exist that can restrict the use of general obligation bond financing. The first two are essentially legal in nature; i.e., they are restrictions that have been placed on municipalities by a local charter or by state law.

First, and most important, is the need in some states to obtain voter approval for any proposed general obligation bond issue. This requirement can severely limit the use of the mechanism: projects that are planned are "conditional" until they have voter approval. Often, elaborate publicity campaigns are prepared prior to the scheduled vote. These are expensive and may actually contribute to "superficial" analysis of solid waste needs, since officials must spend time in "advertising" rather than analyzing. Even if thorough analyses were prepared for dissemination voters cannot be expected to evaluate all of the complex technical and economic issues involved in solid waste processing and funding.

The second, and far less important constraint that may exist is a state-imposed debt ceiling for general obligation debt. A community that wishes to issue general obligation if it has reached the ceiling has two alternatives. First, it can have the debt ceiling increased. In those areas where the ceiling is a function of assessed property value, this is easily accomplished by a simple reassessment. If the ceiling is a function of a variable that is less easily changed, the second alternative is to have the ceiling raised by the legislative body that established it. This is the route frequently followed for special projects that a community could not otherwide undertake.

The third constraint is perhaps the most obvious: general obligation bonds can only be used by political jurisdictions that have the power to levy property taxes. This means that management of the project or system to be financed must be undertaken by an arm of the municipal government.

Effect of Subsidy Level

Many of the financial mechanisms currently being used or being considered for use, by a municipal government are subsidized to some extent by the federal government. In the case of general obligation bonds, the direct[1] subsidy is the reduction in interest charges that occurs as a function of the tax-exempt nature of the interest paid to the institution supplying the capital. The bank passes on its savings in taxes to the community in the form of lower interest charges. Thus, the interest charges on municipal bonds are lower than comparatively rated corporate issues.

It is generally estimated that the subsidy is in the neighborhood of 2 percent. The impact of the subsidy is to stimulate investment in capital projects above what would otherwise occur. This can be seen by simply noting that the demand for capital funds is a downward sloping function of the interest rate. Municipalities can "afford" to invest in projects that are marginal in an economic sense, projects that would in most cases be rejected or deferred if interest rates were higher.

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[1] Municipal governments also receive an indirect subsidy, since local taxes are considered deductible expenses for those individuals who are directly involved in paying the local taxes. Thus, for each dollar increase in local tax receipts, federal tax receipts should fall by, approximately, the average marginal tax rate of individuals in that community, multiplied by one dollar. This subsidy has an equally beneficial effect on municipal expenditures for operations and for investment. However, it is interesting to note that communities inhabited by individuals or corporations with large incomes receive benefits at the expense of poorer municipalities, since the average marginal tax rate, and hence the subsidy level, will be larger in the former case than in the latter.

It is interesting to note that this subsidy does favor municipal expenditures, and puts private corporations at a disadvantage. A private firm that might wish to compete with a municipal agency is in a less favorable situation with regard to capital, except in those instances where a corporation is given the rights to raise funds through tax-free bonds.

The general obligation interest subsidy does not give a community more of an incentive to invest in solid waste facilities than in other municipal projects. Of course, solid waste will receive more capital funds than if no subsidy existed, but this is so only because all municipal projects receive more funds at the margin.

Because the federal subsidy to municipal general obligation bond financing is non-discriminatory, a change in its level will have only an indirect effect on investment for solid waste facilities and equipment. For example, if the non-taxable interest feature of municipal debt were to be eliminated, as in the proposed Proxmire Bill, it is easy to predict that all municipal borrowing, and hence investment, would be reduced. (However, the Bill itself does carry a provision that would institute a direct interest subsidy to municipal governments that would be calculated in such a way as to restore the balance that now exists.) However, investment in a community's solid waste system would only be affected insofar as a general reduction in capital formation would occur. Changes in the level of this subsidy would affect only indirectly the type of projects and systems being funded.

Disruptions in the Solid Waste System

The relative ease of raising capital with general obligation bonds is a deterrent to change in the existing public/private management mix. Since a municipality can raise nearly any amount of money, at subsidized interest rates lower than those available to corporate borrowers, there is little incentive growing from capital needs alone for officials to consider the use of private system operators. This effect is reduced by the existence of mechanisms which subsidize the private sector, such as industrial revenue bonds.

Municipal Revenue Bonds

Complexity of Application

Municipal revenue bonds are among the most complex borrowing methods a community can use to obtain long-term capital funds. This is the case because the information requirements of the bond circular are extensive. Essentially, the community is pledging only the net revenues[1] from the facilities to be installed as a means of paying both principal and interest charges. For this reason, a great deal of effort must be expended to prove to potential suppliers of capital that the proposed system will be technologically and economically viable. It is not unusual for municipality to prepare a revenue bond circular that contains fifty pages of text and tables, in an attempt to describe every aspect of the system, the exact usage of bond revenues, the economy of the service area, all contractual agreements that have been entered into, projected revenues, expenses and earnings, and any other information that might be relevant to the project. Obviously, the more convincing this information is, the lower the perceived risk of the project, and the bond will be, and hence the interest rate.

Because of the complex information requirements, arranging for a municipal revenue bond can be a rather lengthy procedure. Actual calendar time

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1. The discussion on municipal revenue bonds assumes, in the first instance, that "true" revenue bonds are involved. It has been emphasized earlier in the text that most "revenue" bonds, as issued by municipalities, are more like general obligation bonds than true revenue bonds, especially when the funds are to be used for solid waste facilities.

will generally be a function of the amount of information that has been prepared during the early phases of project planning. Fortunately, much of the analysis that must be presented in the circular will already have been prepared for project planning, so preparation of the circular can be started during the project planning stage. Nevertheless, much time can be lost if the community's financial consultant feels that financial schedules should be prepared in more detail, in order to facilitate the offering.

Finally, it is absolutely essential that extensive technical and economic analysis of the project be performed by experts outside the municipal government. The reasons for this are obvious. Any potential supplier of capital would certainly require that a disinterested party evaluate the project's viability and whether the numbers and projections being presented are reasonable. Thus, one would expect that the municipality would call in both engineering and business consultants to "verify" the circular, much as a public accountant attests to a corporation's financial statements.

A very important finding in this report is that independent analysis is rarely provided or only performed superficially for those "revenue" bonds that are used to raise capital for solid waste facilities and equipment. There seem to be two somewhat related reasons for this state of affairs.

First, and perhaps most important, the bonds can be structured so that there is little or no financial risk to the investor, thus obviating the need for careful analysis. A wide variety of methods are available to do this, ranging from a simple statement that revenue deficiencies will be made up from general municipal revenues, to more complex long-term contracts or leasing arrangements. The important result, however, is that the risk associated with the project is shifted from the suppliers of capital to the municipality's taxpayers. Thus, investors become concerned more with the ability of the community to repay than with the technical and economic analysis of the project.

The second reason for the lack of impartial technical and economic analysis seems to be, simply, that most municipalities can get away without it. Generally, a project feasibility study is performed by a consulting engineer. This study is often deemed adequate for inclusion in the bond circular. If this study does not include a reasonable amount of economic analysis, whatever is missing is often prepared by the municipality's financial advisor. The fact that the engineering consultant who prepared the feasibility study will almost always be asked to "design" the project and presents a clear possibility of conflict of interest.[1]

In summary, it must be concluded that although municipal revenue bonds should generate extensive technical and economic analysis, this is often not the case. While the presence of this analysis may be important, it often seems to be prepared to satisfy "tradition," and may be worth less than nothing if it lulls municipal officials into a false sense of complacency.

Ability to Raise Capital

Municipal revenue bonds can only be used efficiently to raise capital for specific projects that (a) require substantial amounts of long-term capital, (b) will be managed by an independent authority or distinct city agency; and (c) will provide a service that will generate a segregated revenue source large enough to operate, maintain, and retire the bonds. Within these limits, however, a municipal revenue bond seems perfectly capable of obtaining sufficient capital for nearly any project.

In recent years, revenue bonds have increased in use much more than general obligations,

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1. The typical fee for engineering design is 10 percent of the final cost.

reflecting the growth of municipal departments and of special commissions and authorities to operate utility, toll-road, airport, bridge, and other facilities. Authorities are sponsored by both state and local governments, and, in some cases, jointly by two or more jurisdictions.

At the end of 1968, revenue bonds constituted over 40 percent of total "municipal" long-term bonds outstanding -- as contrasted with less than 14 percent in 1950. In 1972, 41 percent of the new municipal issues were revenue bonds.[1] Unfortunately, there is no way to estimate the percentage of revenue bonds that are more or less guaranteed by the state or municipality. However, conversations with investment bankers and legal counsels give the general impression that a very large percentage are structured in this manner.

Perhaps the main distinction between municipal revenue and general obligation bonds is the somewhat narrower range of dollar amounts for which a municipal revenue bond is a realistic option. For example, at the lower end, a general obligation bond of $500,000 would be possible, but a revenue bond of anything less than $1,000,000 would be unrealistic. This is true primarily because of the transaction costs involved. In general, it is not economical to prepare a detailed circular for a small amount of capital.

Typical size differentials between revenue and general obligation bonds can be understood by examining the average issue sizes. For example, of the bond issues reported in 1972, to the Securities Industry Association, 1,342 revenue bonds were used to raise $9.3 billion -- or an average of $7.0 Million per issue. This is in striking contrast to the figures reported for general obligation bonds: 4,114 bonds raised $13.3 billion, or an average of $3.2 Million per issue.

This difference is quite significant in the area of solid waste system financing. Recall that the largest number of solid waste disposal systems can at best be classified as sanitary landfills. This can be largely attributed to the high percentage of small communities -- relative to the total number of communities in the country -- which find landfilling to be the only reasonable system from an economic point of view. The point has also been made that the installation, or upgrading, of most sanitary landfills would require expenditures well below $1 million. Thus, the use of revenue bonds for solid waste system financing will be a realistic option in only a small percentage of all communities.

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[1] Securities Industry Association.

It should be noted, however, that although only a small number of communities have planning facilities more capital intensive than landfill, this still accounts for a large dollar volume -- over $600 million, as noted in the first section of this report. If a significant trend toward regionalization should develop, with attendant increase in independently-managed solid waste disposal organizations, the revenue bond concept will likely become a more frequently utilized financing mechanism.

Cost of Capital

There is little doubt that the cost of obtaining long term capital with a municipal revenue bond is greater than the cost of using a general obligation issue. The exact amount of differential in the interest charges will vary as a function of many variables. Public managers can obtain estimates of the differential, under any given circumstances, by soliciting bids from an investment banker on a negotiated basis. The investment banker can make these estimates on the basis of a municipality's typical bond rating, the size of the issue, the nature of the "guarantees", and credit market conditions at the time.

The most significant independent variable is the security of the issue. Whenever a municipality chooses to structure a specific revenue bond to give it the risk attributes of a general obligation bond, the interest differential will be small or non-existent.[1]

Even when a municipal revenue bond is made as secure as possible, however, its total costs will be higher than a general obligation issue. This is so because of the greater indirect costs associated with a revenue bond issue (i.e., those costs not reflected in the interest rate). For example, if an outside consultant is retained to evaluate the project, the cost of this service should be attributed to the cost of capital. Even if outsiders are not involved, the cost of preparing the more complex circular will certainly be higher than what must be expended for a general obligation bond circular.

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[1] During the final preparation of this report, it came to the attention of RPA that the Michigan State Supreme Court had recently ruled on a taxpayer suit questioning the legality of a municipal government pledging general revenues to make up any deficit in project revenues. The case has not yet been published; thus, it was not possible for RPA to interpret the issues. However, it appears that the decision may be quite specific and limited to projects involving use of a municipal facility by a private person. The actual case involved a guarantee of bond payments by Wayne County, Michigan, in connection with a local sports arena. In the absence of county intervention, the project revenues were tied to attendance figures for sports activities. The court ruling seemed to be limited to the issue of municipal support of a facility to be used by a private concern, without prior voter approval -- which is required of all general obligation bonds in Michigan. Nevertheless, even if the ruling is limited, the issue of circumventing the need for voter approval may be questioned in other contexts. If this should happen, there can be little doubt that the interest differential between "revenue" bonds and general obligation bonds will begin to rise as the "guarantee" begins to lose value.

Of course, municipal revenue bonds seldom require voter approval and this can be considered a cost saving in relation to those general obligation issues that do require voter acceptance since it is expensive to conduct an election. It should also be pointed out that if a project is delayed while awaiting a favorable vote, increased project construction costs, due to rising construction costs over time, might also be attributed to the financial mechanism. Thus, revenue bonds may actually have some favorable cost attributes in comparison to general obligation issues.

Constraints on Use

The most important reason for using a revenue bond, rather than a general obligation issue can be understood in terms of the different set of constraints governing each mechanism. A general obligation issue may require voter approval, may be restricted because of an existing debt ceiling, and can only be issued by a political jurisdiction with taxing power; a municipal revenue bond has none of these constraints. In fact, municipalities most frequently list this difference as their reason for using revenue bonds. (But see footnote on preceding page) For example, many municipalities use a revenue bond simply to avoid the necessity of obtaining voter approval for a proposed project. Several examples of this have occurred in the solid waste field. In these cases, there doesn't seem to have been any special concern that voter approval could not be obtained. Rather, the attitude was simply: "Why bother to ask?"

The most significant constraints that exist with regard to a revenue bond are essentially economic:

- It can be used only for specific projects.
- It is useful mainly for generating significant amounts of long-term capital.

- It must be managed by an independent authority or distinct city agency.
- It must have a reasonably stable source of revenue.
- It is normally used for projects of relatively low perceived technological risk.

Effect of Subsidy Level

The federal subsidy to municipalities associated with the use of revenue bonds has an impact on investment in solid waste systems identifcal to the subsidy to general obligation debt. To summarize:

- Municipal investment in all capital equipment is stimulated. This, of course, effects solid waste expenditures.
- Increasing the level of the subsidy will have only an indirect effect on expenditures for solid waste facilities and equipment.
- Changing the level of the subsidy will have only an indirect effect on the type of projects and systems that are installed.

Disruptions in the Solid Waste System

As with general obligation bonds, the relative ease of raising capital with municipal revenue bonds can be viewed as a deterrent to any significant change in public/private mix in solid waste management. Revenue bonds are often used specifically in those situations where general obligation debt cannot be issued. Without the availability of revenue bond financing as an effective alternative, the community would be more inclined to consider the private sector.

For example, if a community has reached its general obligations debt ceiling, and has no realistic method for having it raised, it might very well consider, were it not for the existence of revenue bonds, contracting with a private firm for a solid waste disposal system. Revenue bonds give the community the alternative of retaining management control. Or, in the case of a regional authority which might otherwise have considered a private contractor for system financing, revenue bonds now encourage the authority to retain control.

Of course, it has been pointed out that revenue bonds are used only by relatively large cities, or regions, for large projects and the absolute number of these cities using revenue bonds may not be significant. However, it is precisely these larger areas and regional governments that hold the most interest for private operators, who want to put their management skills to work in areas where large-scale economies are possible.

However, no attempt is being made to place a value judgment as to the most efficient public/private mix. This discussion has been presented merely to indicate how different financing mechanisms might influence the situation.

Municipal Bank Loans

Municipal bank loans must be evaluated in a somewhat different context than the two bond mechanisms. Bank loans and bond issues are not usually viewed as alternative sources of capital for the same project. A bank loan can essentially be considered only as a source of short-term capital, and will be reviewed in this framework.

Complexity of Application

It is difficult to generalize about the complexity of obtaining a bank loan because of the wide variety of specialized circumstances that may surround a loan application. For example, many communities have established what can be considered as a "line of credit" with one or more banks in their area. Thus, if a project suddenly requires funds on short notice, it can simply turn to this credit account. The bank that deals with a community on a continuing basis will not have to compile much new information at the time the loan is being processed. Also, if the loan is to be secured by what amounts to a "full faith and credit" clause, the bank will be accepting only a minimal amount of risk, and will not be expected to require a great deal of information.

Since so little information is required, it takes a relatively short time to arrange for a bank loan. If the bank and the community have an ongoing relationship, additional financing might be arranged in a matter of days. If, on the other hand, a new bank is being brought into the picture, a period of several weeks might be required to prepare and process the necessary information.

Finally, it is unlikely that a municipality will have any need to obtain external advice or certification during the process of obtaining a bank loan. Since it is dealing directly with the supplier of capital, it will not have to "guess" what information is most relevant. The bank will simply ask for whatever it needs and no formal circular needs to be prepared.

In this regard, it is also very unlikely that any external technical or economic advice will be required. A bank loan would not be used for "risk" capital and, therefore, technical advice would be meaningless. Also, since a bank would not wish to make a "revenue" loan, where repayment would be tied to a specific source of revenue, economic analysis would also be superfluous.

Ability to Raise Capital

As mentioned above, bank loans can be used efficiently to raise short-term capital of a relatively modest amount. There is essentially no minimum, and the maximum would be a function of the bank involved. Thus a large New York, Chicago, or other major city bank could supply several million dollars, whereas a smaller local bank might have a maximum of several hundred thousand dollars.

Bank loans have found their greatest use in the solid waste field in financing collection equipment. For this purpose they are a very efficient capital source, since they are usually written like a typical automobile loan, with a minimum of complexity. Bank loans, however, have been used very infrequently for financing solid waste disposal equipment. There seem to be two reasons for this.

First, those smaller communities that might consider a bank loan (because their proposed system would not require enough capital to justify a bond issue) have either financed with pay-as-you-go, or, perhaps more typically, have not financed anything. And second, larger municipalities have needed either more or longer-term capital than a bank would wish to supply. These larger areas have typically utilized general obligation bond issues to obtain capital.

In summary, then, bank loans as a source of short-and medium-term capital may give smaller communities the opportunity to finance certain kinds of solid waste disposal equipment and facilities when pay-as-you-go or bond financing must be ruled out. However, except in isolated instances, such as the Great Falls, Montana shredder, they are unlikely to become a significant source of capital funds for solid waste.

Cost of Capital

It is difficult to generalize about the cost of capital associated with municipal bank borrowing because of the wide number of circumstantial variables reflected in the costs. For example, since the risk of a bank loan is essentially similar to that of a general obligation bond issue, the interest charges attributed to this factor would be similar to those prevailing on a short-term, general obligation issue -- if such a mechanism existed. However, other variables will also be reflected in the interest rate; e.g., the term of the loan, the loan size, and the bank involved.

In addition, some of the indirect costs that would be separately charged in a bond financing will be subsumed in the interest rate of a bank loan. For example, if the bank provides legal assistance, and helps the community to prepare the loan application, this will be reflected in the interest charge.

In general, though, it would not be unfair to say that a municipal bank loan is a relatively inexpensive capital-forming mechanism -- essentially comparable to a general obligation issue.

Constraints on Use

Bank loans, like municipal revenue bonds, have only economic constraints on their use. Voter approval is generally not required; there are no debt ceilings; and they can be used by authorities and public corporations that do not have general taxing powers.

The meaningful economic constraints that have already been mentioned are the relatively low maximum for loans and the relatively short term for which a loan can be engineered. Since these economic constraints are so significant, bank loans are simply not an effective alternative to either general obligation or municipal revenue bonds. Their use in solid waste financing will undoubtedly continue to be limited.

Effect of Subsidy Level

Interest on bank loans to municipalities, like that on municipal bond issues, is tax-free to the supplier of capital. The effect of this federal subsidy on bank loans, insofar as it impacts on municipal investments, is undoubtedly much less than its effect on bond issues. This is true because bank loans to municipalities are only rarely used for investment spending. In other words, since the economic constraints on bank loans preclude their use as a substantial source of funds for investment, the federal subsidy involved is less effective in encouraging investment than is the subsidy to bond issues. To put it yet another way, one dollar of federal subsidy to bank loans encourages less investment than one dollar subsidy to a bond issue.

Beyond this fact, it can be argued that the secondary effect of the subsidy on solid waste spending is relatively insignificant. Municipalities do not generally use bank loans for funds to invest in solid waste processing and disposal equipment. So increasing the level of the subsidy would have, at best, only a minor and indirect effect on expenditures made for solid waste facilities and equipment. Furthermore, changing the level of the subsidy could not be expected to have a measurable effect on the type of projects and systems (for example, the labor-capital ratio) that would be installed.

Disruptions in the Solid Waste System

In contrast with municipal general obligation or revenue bonds, bank loans do not seem to have much effect on the existing public/private management mix. Since a bank loan would rarely be used to finance long-term investment in solid waste equipment, its use does not discourage a municipality from utilizing a private contractor. In fact, in those larger communities where private firms would be most interested in entering the solid waste field, bank loans are not a meaningful capital financing option.

Leasing

Leasing, like bank loans, must be viewed strictly as a short-term source of financing. It is rarely used by a municipality except to provide interim financing for equipment needed before appropriations or long-term capital arrangements can be made.

Complexity of Application

Generally speaking, the negotiation of a lease agreement is an extremely simple process, requiring only a few days time at the most. Typically, in negotiating a leasing agreement, the community first informs a leasing agent of its intention to acquire a certain piece(s) of equipment. A proposal, including terms, lease documents, and credit requirements, is then sent to the municipality. A very small community might be required to supply financial statements, and perhaps a bank reference. In a larger community, however, where the typical case would involve only a few pieces of equipment to be leased, the amount of the least payments relative to total community cash flows would be so insignificant as to obviate the need for a credit check.

When the forms are returned to the lessor, a purchase order is prepared, sent to the municipality for endorsement and then forwarded to the equipment supplier. Payment is then made by the lessor to the supplier upon acceptance of the equipment by the municipality. These transactions may take a few days, even as little as one day, depending on the amount of the lease and the size of the community.

Because the lessor will retain ownership of the leased equipment, the transaction requires no certification, other than an assurance of the municipality's general credit standing. From the community's standpoint, any technical or economic evaluation of the equipment being leased will probably have been performed prior to the lease transaction, but only if plans are being prepared for a large expenditure program. The reason for this is that leasing is usually considered a financing source of last resort. Consequently, it would be rare for a municipality to prepare an expenditure program with the intention of substantial lease financing.

Ability to Raise Capital

Leasing is almost exclusively used to finance specific pieces of equipment over the short term-normally five years or less. In the case of solid waste, the equipment would include rolling stock and perhaps some moderately priced compaction equipment. It would be unusual for a leasing company to consider financing pieces of equipment that could not be resold, if need be, or that might cost more than a few hundred thousand dollars.

Consequently, leasing has been used primarily to finance collection and transfer trucks, and to a lesser extent, landfill heavy equipment. However, because of the high cost of leasing, relative to other sources of capital available to a municipality, its use has been extremely limited. It is anticipated that leasing's primary attraction will continue to be its ability to provide a flexible interim source of capital to finance equipment needs.

Cost of Capital

Unlike most other sources of capital, lease agreements have fairly uniform rates which the leasor will apply to any piece of equipment, providing it satisfies certain minimum criteria. These rates may vary, however, depending upon the amount involved in the transaction and the credit risk.

The effective annual interest rate is high, typically 12-18 percent. This rate would apply to either private or public leasees. Since the municipality could normally borrow from a bank at considerably lower rates, it is understandable that this mechanism is used only as a last resort.

Constraints on Use

The significant constraints on the use of leasing appear to be as follows. Leasing can normally be used only to finance equipment which could be resold during the lease term. Furthermore, lease terms are usually limited to a maximum of five years. Finally, the amount of capital that can be lease-financed is limited.

In addition, some states impose a legal constraint on the use of lease financing, by prohibiting municipalities from entering multi-year, non-cancellable contracts. Thus, in some areas, the use of leasing would have to be limted to one-year terms, or to cancellable leases only.

Effect of Subsidy Level

Since the interest charged to a municipality as part of the lease rental payment is treated as ordinary taxable income to the lessor, there is no direct subsidy for use of leasing. This is the primary disadvantage of this mechanism from the municipality's viewpoint, and this also helps explain why leasing is such a high-cost alternative, relative to other sources of capital.

Disruptions in the Solid Waste System

Leasing would not be expected to have any direct effect on the existing mix between public and private solid waste management. Because leasing is available to both public and private organizations at essentially the same interest rates, it can be construed as essentially a neutral mechanism.

Current Revenue Capital Financing

Complexity of Application

The pay-as-you-go technique for financing municipal capital investment is the least complex financial mechanism available--since money already in the community's possession is used for the facilities and equipment. Thus, no formal, or even informal, financial documents need be prepared. Further, no external advice from consultants or certification by a legal advisor would be required. Thus, the mechanism does not, by itself, encourage either technical or economic analysis. However, there is some evidence that in cities that maintain specialists to review program requests, capital requests from current funds may receive at least as thorough an analysis as a program requiring debt financing. This type or review is dependent, however, more on the management practices of the municipality than on a requirement established by the pay-as-you-go method.

Of course, the expenditure would have to be approved at some level in the municipal government. Usually this would be a city council and the mayor. However, this same level of approval would be required for whatever financing mechanisms were to be used. Thus, the financing of capital investment with current revenues is clearly the simplest process for a municipality to follow.

Ability to Raise Capital

Unfortunately, it is in the ability to raise capital that the pay-as-you-go technique is lacking. In fact, it is precisely because this mechanism is inadequate that others exist.

The absolute amount of capital investment that can be funded from current revenue is obviously a function of both the general wealth level and the size of the community. Typically, the amount of current revenues that municipalities budget for solid waste is less than their respective capital requirements. This is true even in wealthier communities--where tax dollar receipts per capita are higher--because such communities often have a higher level of service standards and thus, proportionately larger capital requirements. Even the wealthiest communities would normally not be able to fund all of their investment requirements from current revenues.

What seems to be true is that most communities can fund some investment activities from their general revenue fund. Of course, if they do raise capital with other mechanisms, the activity which is supposedly funded from general revenue is rather arbitrary. In other words, the community investment budget is really funded from several sources, only one of which is general revenues.

Clearly, this form of budgeting is the only one which makes economic sense. As mentioned earlier, it would be inequitable to current taxpayers to expect them to pay for a system that will be used far into the future, and in some sense at no cost to the future residents. When investment capital is borrowed, and receipts from the service provided by the system match the system cost, this inequity is removed.

Additional analysis of this issue is nearly impossible, owing to the wide variety of community sizes, wealth levels and requisite solid waste systems. Suffice it to say, that although pay-as-you-go has been the most prevalent form of solid waste capital financing, this is essentially because so little capital has been spent. Two reasons can be indicated. First, there has not been a large demand for capital equipment in the vast majority of communities; and, secondly, where capital expenditures have been made, they have been spread out over time.

Cost of Capital

Obtaining investment funds from current revenues requires no community involvement with external suppliers of capital. In this sense, then, there is no "cost of capital" that can be compared with the costs of other financial mechanisms.

Nevertheless, capital is never a free good. In this case, the cost of capital may be thought of as an "opportunity cost." In other words, what is the return on investment that could have been earned on the funds if the municipality did not choose to make the investment. The opportunity cost may be expressed in terms of foregoing social benefits that could otherwise be provided to members of the community.

For example, at a minimum, the municipality could return the funds to its taxpayers in the form of lower taxes. These individuals could "invest" the money in a savings account. Thus the municipality could compare the rate of return on savings accounts with the next alternative borrowing method--e.g., a general obligation bond.

In fact, then, it might be said that pay-as-you-go capital is more expensive than certain forms of borrowing. This is so because the federal government directly subsidizes municipal borrowing; the pay-as-you-go process gets no direct subsidy.

Constraints on Use

Obviously, the one major advantage of current revenue financing is that there are essentially no outside constraints on its use. Whatever funds a municipality has available can be invested in any way it chooses. Of course, the internal constraint of capital availability and competing demands for funds is significant.

Effect of Subsidy Level

As already mentioned, there is no direct federal subsidy associated with the use of pay-as-you-go capital financing. There is a second-order subsidy to the extent that individual tax payments (i.e., property taxes) to municipal government are deductible expenses from federal tax returns. However, this subsidy would operate even when outside capital is obtained.[1] Thus, there is a net financial disadvantage to the inhabitants of a municipality when pay-as-you-go capital financing is used relative to more highly subsidized mechanisms such as general obligation or revenue bonds.

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[1] In contrast, if solid waste revenues are collected via user charges instead of through general tax receipts, this subsidy will be eliminated, since user charge payments are not tax deductible.

Disruptions in the Solid Waste System

Financing solid waste systems with capital from the general revenue fund is essentially a neutral mechanism insofar as its effect on the public/private mix in the management of solid waste systems is concerned. Since there are no direct federal subsidies involved, there is no financial reason for a community to feel committed to installing and operating the system itself.

In fact, if a municipality that has used pay-as-you-go financing for several years suddenly is faced with the necessity of a large capital outlay, it might be inclined to use a private operator rather than borrow funds. This is strictly a psychological effect, but nevertheless could be quite significant.

Private Financing

Complexity of Application

The use of a private firm to construct, own, and operate a municipal solid waste system is, in reality, not a financing mechanism at all, since the municipality does not have to invest capital as such. Nevertheless, it is useful to analyze it as a financial option, since it clearly is an alternative to municipal borrowing or general-revenue financing.

In this context, the complexity associated with the mechanism does not involve information requirements or external technical and economic consulting. Rather, problems may develop in locating an acceptable firm, negotiating a contract, overcoming public dissatisfaction with a proposed site, dealing with public employees who may be displaced, or meeting a host of other organizational/management issues.

There is some reason to believe, however, that the use of this mechanism will actually result in more technical and economic evaluation of any proposed system. This analysis will generally not be performed by the city or its consultants, but by the private firm itself. The reason is obvious. If a private firm is being operated for profit, and, in addition, must compete with other firms for a system contract, there is a strong incentive for efficient planning and management. Unfortunately, there is little hard evidence in this area since few disposal operations have been financed and managed by private firms (except the ownership of dump sites in some areas).

Ability to Raise Capital

Here, too, there is little evidence that can be cited. Where disposal systems have been financed by private owners, the system cost has rarely gone above $1 million. This should not be construed to mean that private firms could not raise much larger amounts of investment capital.

However, the ability of a private firm to raise capital is restricted by more constraints than would be faced by a municipality.

This is simply because the risk associated with mechanisms available to a private firm is higher than that associated with a general obligation bond. This risk will be reflected, at a minimum, in higher interest rates and, under certain circumstances, the cost associated with the risk would result in a total inability to raise the necessary capital.

In summary, to date there has been only limited experience with the use of private firms to finance and operate solid waste disposal systems. The private sector is becoming more interested in this area, however. If financing mechanisms involving both a private firm and a municipal government prove viable, it is likely that more private companies will become involved in the field.

Cost of Capital

Since municipalities are not raising capital as such, this issue is not relevant to the evaluation. Suffice it to say, however, that the cost of capital to a private firm will undoubtedly be higher than the subsidized cost to a municipality. This higher cost will certainly be reflected in the system charges.

However, there are other subsidies (e.g., depreciation, investment tax credits) which do operate in favor of private firms and which tend to reduce operating charges. On balance, the absolute cost effect is dependent on the specific situation.

Constraints on Use

Private firms are not used more frequently to finance solid waste disposal because of the legal constraint that prevents many municipalities from signing long-term contracts. No firm could afford to risk installation of capital equipment unless it were sure that its revenues would continue for a period long enough to insure capital recovery. Negotiations between municipalities and private contractors often break down over this point.

Other less important constraints that occasionally arise in some municipalities involve the potential displacement of city employees, and a perceived risk of service interruptions. This latter issue involves the problems that could arise should a private firm be forced into bankruptcy. Finally, there is the economic constraint that might exist if a municipality wished to have a capital intensive, technologically risky system installed and the private firm could not obtain capital for such a project.

Effect of Subsidy Level

As mentioned earlier, a municipality choosing to use a private firm as an alternative capital investment mechanism will not now receive any direct federal subsidy to assist the capital formation process. In raising capital, then, the private operator will have two disadvantages, in comparison with a municipality issuing a general obligation bond. The first is the higher interest rate that must be paid because the interest payments received by the lender are considered taxable income, whereas the payments on a municipal bond are tax-exempt. The second is a function of risk. It is virtually impossible for any private firm to acquire investment capital with the same risk as would be associated with funds raised by a general obligation bond. In other words, a community's "full faith and credit" clause, backed by unlimited *ad valorem* taxing power, is better security than a private firm's net operating revenue.

Since private firms must pay higher costs for capital, they will probably install less capital intensive systems than a municipality might choose if it were to invest its own capital. In this context, it is interesting to note that there are few, if any, privately owned incinerators operating in the United States. Where private solid waste disposal systems have been installed, they are almost exclusively landfill--with a minimum of capital equipment.

There is some reason to believe that a municipality may be able to pass its federal subsidy along to a private operator under certain circumstances. This would be done, for example, by issuing an industrial revenue bond, which essentially permits a private firm to issue tax-free bonds. It would then be much easier for a private firm to acquire investment capital. This subject will be discussed in greater detail later in the report.

Disruptions in the Solid Waste System

A municipality's decision to use a private firm rather than to finance its own solid waste disposal system is itself an alteration in the public/private mix.

V. ORGANIZATIONAL ALTERNATIVES FOR FINANCING AND MANAGEMENT

In the competition for municipal or state dollars, many approaches are used to secure funds for solid waste services. This section will discuss one such approach: the establishment of a special organization to raise money to finance the service. Not all institutional forms involved in the field of solid waste management will be considered. Rather, discussion will be confined to those organizations created solely to raise new, or "seed," money, or to increase the level of funds already used for solid waste management. Several individual organizations will be examined as will the reasons for their selection.

Decision-makers at the municipal or state level can improve an existing service, or start a new service, in two ways. First, they can raise capital by working through the normal approval process established by law, and can then assign the capital and the new work to an existing municipal department.

Second, they can develop a new organization to provide the service, and can then meet the capital requirements of the service through the new organization. This method is normally more complex than working through an established organization because of the legal activities involved in forming the organization; e.g., the selection of staff, the development of administrative and operational procedures, and planning and budgeting activities. All this preparatory work must be completed before the organization begins to provide service or invest its capital. Despite the work involved, however, many municipalities and states select this alternative. They are motivated by reasons such as the constitutional debt ceiling which would prohibit financing by the municipality. Frequently, the requirement for voter approval becomes an additional constraint because it is time consuming and risky. Also, when municipalities establish new organizations they gain the attention and publicity that surround a new operation. On the other hand, a new operation also suggests the possibility of creating new jobs.

The types of organization that have been created expressly for financing, as well as management, include the following:

- Public authorities.
- Private corporations.
- Non-profit public corporations.
- Multi-community cooperatives.

Public Authority

Historically, authorities have been established as a means of separating government enterprises that are commercial in nature from more traditional government services. States and cities have been using the authority form since 1945. At that time, rapid industrialization and economic growth brought about a need for increased public services. Since state and local government debt ceilings made it difficult to expand services, and since many of the new services were revenue producing, it seemed more appropriate to establish new organizations than to rely on traditional government agences. Publicly-held corporations had become, (in the late 1940's) the dominant form of business organization. The general operational effectiveness of the corporation was considered a desirable model for a commercial type of government service. By the 1940's, nearly all states had passed enabling legislation, and established the legal procedures necessary for the formation of authorities.

Authorities have been defined as:

> ...corporate bodies authorized by legislative action to function outside of the regular structure of government in order to finance and construct and usually operate revenue producing public enterprises.[1]

Considerations in the Formation of Authorities

Most municipalities establish an authority to provide a revenue-generating service when confronted with one or more of the following problems:

- The constitutional debt ceiling prohibits financing by the municipality.
- Gaining voter approval for financing is either too time consuming or too risky.

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[1] State Public Authorities, The Council of State Governments (Lexington, Kentucky), July, 1970, p. 2.

- Political activity related to the service has hampered previous programs.
- Multiple political entities will be served by the authority.
- Greater autonomy and freedom from municipal budgetary and administrative control will mean a more efficient delivery of service.

The authority is well suited for financing and managing solid waste services. The authority can raise capital dollars from short- and long-term notes and from revenue bonds. It cannot, in most states, raise capital or operating dollars from taxes. With the exception of Colorado, where a new law provides certain types of authorities taxation powers, the authority normally has no power to tax and cannot rely on the tax base of a given political jurisdiction unless officials of that jurisdiction allocate funds. Therefore, the operating funds and a portion of the capital funds, are raised by levying charges on the users of the authority's service, even where the user may be the municipality itself.

During our field research, two existing and one proposed solid waste authorities were studied. Of the two studied, one is primarily a financing vehicle; the other has developed, financed, and managed an incinerator.

In Pennsylvania special purpose activities which generate revenue are traditionally financed through an authority.[1] When Harrisburg decided to invest $12 million in an incinerator, its financial advisors suggested that an authority be created. In this instance, the authority is a "paper" organization established to issue revenue bonds. It has no employees and no place of business. The city leases the incinerator from the authority, operates the facility, keeps the authority's books, and pays its financial obligations.

Harrisburg's financial advisors, consulting engineers and bond counsel told us that two factors influenced their decision to finance solid waste services through an authority: the city's debt ceiling and doubts over voter approval of the incineration project. Their concern about the debt ceiling seems unrealistic, since the remaining debt capacity of the city at the time of the bond issue was 82 percent. This would have been reduced to 39 percent if the bond had been a general obligation issue. Voter approval for the project as a whole was passed by establishing the authority, but three taxpayer suits were filed which kept the incinerator project in the courts for one year. When citizens do not have the opportunity to influence a decision affecting their community they often appeal to the courts.

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[1] Interview with Mr. Benjamin Shoemaker III, C.C. Collings & Co., November 16, 1972, Philadelphia, Pennsylvania.

The Incinerator Authority in Harrisburg does not provide a revenue-generating service. Its purpose is to arrange for funds that are guaranteed and will be paid for by the city. In essence the authority is a mechanism to create a de facto general obligation bond outside the normal g.o. process.

The Southeast Oakland Incinerator Authority in suburban Detroit is quite different. Initially, it was formed with a specific job to do, incinerate and dispose of the refuse from fourteen communities. The Authority provides several communities with a disposal service that none of the communities could have afforded individually. Furthermore, the Authority's regional coverage solved the common urban problem of limited availability of disposal space.

To start service in Southeast Oakland County, capital had to be raised to develop the facility. The authority used regular revenue bonds, not the de facto g.o. type used in Harrisburg. The Authority has issued three such revenue bonds since its inception. Bond payments are totally dependent on the charges for service. The income is guaranteed by the commitment of the fourteen communities to use the service. To insure that each community has the opportunity to voice its opinion on policy matters, a representative from each community forms the Authority's Board of Trustees. Ostensibly, service charges can be regulated by the Board to cover any charges in capital and operating costs.

A third and quite different type of authority has been developed in Colorado. At the urging of the Municipal League, the state legislature passed an enabling act which permitted municipalities to form regional service authorities. To create such an authority, the largest county in an area must appoint an "originating commission". This commission prepares a voter resolution to go on the ballot. The voters must approve the authority by a simple majority and must select up to sixteen services they wish the authority to provide. One of the sixteen services can be solid waste collection, processing and disposal.

The regional authority is granted the power of taxation if voters approve a mill levy. With this tax power, the authority can issue general obligation and revenue bonds, can receive grants, use bank loans, and share in the taxes of its member communities. The authority also has the right to contract with the private sector for the provision of services.

This authority provides one unusual safeguard for its member communities. If one community is dissatisfied with a service, it can vote on whether or not the service should be continued. If just one community rejects the service, it is cancelled for all member communities. This puts the authority under greater pressure to perform more responsibly than the traditional authority.

The Denver region is interested in the authority concept and will put the matter to a vote in the next election. It is not yet clear whether there is strong voter support for including solid waste as one of the sixteen services to be provided by the authority.

Observations

In summary, public authorities can provide a useful management and financing alternative if an area needs a special organiztion to provide solid waste services. The objective of an authority is to establish an organization to perform a given service and, in most cases, generate sufficient income so that the service can be self-supporting. The difference between the Harrisburg and Southeastern Oakland County authorities is in their purpose. In Harrisburg, the objective was to provide financing. In Southeastern Oakland County, the objective was to provide the service. The financing was a means to this end.

The evaluation of authorities as a financing vehicle is difficult, because, in most cases, authorities are established to provide services. Financing takes place only when the organization needs major amounts of capital that it cannot raise internally. The issuing of bonds and the acquiring of bank loans are generally the same financial mechanisms as used by any public body. Thus financing by an authority is normally one of the many important activities in which the organization is involved. However, authorities can be evaluated in the light of how well they facilitate the financing activity.

Financing through an authority is administratively complex because the authority must be designed and approved by another governmental body. The ability of the authority to raise capital depends on the debt provisions of its charter. Also, its ability to raise capital will depend on the performance of its management on day-to-day operation and on meeting all the authority's financial obligations. The cost of capital to an authority will depend on what type of debt issue is used, plus how well the authority has performed.

Authorities are used in solid waste and there are no important constraints to their use in this field. Although authorities per se are not subsidized, their debt issues are. Hence there is no particular positive or negative monetary stimulus on authority formation. Authorities, basically, should not provide any disruption in solid waste systems.

Most states and many communities have experience in using authorities, so the learning curve is not steep or lengthy. Despite the potential advantages of an authority, there is a danger that it can become remote from government or public control. Separated from the municipal bureaucracy, protected by a board of directors, the authority can, and, in some cases, does, become self-serving.[1]

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[1] This is a general observation made of authorities by such noted political scientists as James C. Charlesworth, James Q. Wilson, Aaron Wildausky, to identify but a few. The author made this observation also based on studies of over 100 municipal government operations.

Private Corporations

Private corporations offer the community the most dramatic financing opportunity, to "get out" of the business altogether. In this light, many communities pass complete financial and performance liability for solid waste services to an outside contractor. The contractor raises the capital, purchases the equipment and operates the community's solid waste system. Hence, the municipality is relieved of the need to devote capital for solid waste facilities or equipment. The community's financial responsibility is limited to paying for the service through contract payments or paying through direct charges to users.

If the municipality allows the private operator to bill individual households and firms directly, it can reduce the city budget. In addition, user charges may achieve a more equitable distribution of solid waste system costs.[1]

Reliance on contractors, in theory, also provides the greatest long-term flexibility. The community is committed to a specific system only for the length of the contract.

Considerations in User of the Private Sector

Several factors that influence a municipality to turn to the private sector are:

- The cost of service is less than an alternative approach.
- Political influence on the service is minimized.

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[1] A user-charge system related to the amount of waste generated is theoretically preferable, in an equity sense, to funding the solid waste system from tax receipts.

- Municipal budget[1] and municipal bureaucracies are decreased.
- The quality of service is improved.

Contract Considerations

To secure a stable revenue base in solid waste management, private firms usually prefer long-term contracts (five years or more)[2] with the ability to escalate charges as their costs increase. Most long-term contracts have an escalator clause that is tied to the area's price index. Cities, on the other hand, seem to prefer contracts that coincide with political terms.[3] These terms typically range from one to four years. They may also be constrained by legal limits set on length of contract terms.

Contract fees usually fall into two categories: the fixed fee, and the fixed fee with an escalator clause. The length of the contract usually influences the fee arrangement. One-year contracts normally use a fixed fee, and longer-term contracts usually include an escalation clause that allows the company to make fee changes if they experience cost changes.

The contract generally provides the municipality with power to set rates and regulate the performance of the service.

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[1] Budget reductions are possible if users are charged for service instead of having the city pay for the service from a budget allocation. Further reductions are possible if the city has employees in this service who will be discharged.

[2] Interview with Roger Ramsey and John Vanderveldt, Browning-Ferris Industries, Inc., Houston, Texas, December 13, 1972. Discussions with Combustion Engineering, American Thermogen, Combustion Equipment Associates, Carborundum during March, 1973.

[3] This is the concensus of opinion in the forty-five cities visited during the study.

Use of Private Sector

In Minneapolis, Minnesota, the city government assisted 50 private haulers to form a private corporation to collect approximately 60 percent of the city's trash. Minneapolis also granted a five-year contract to a second private firm, for operation of two transfer stations and one landfill site. All residential refuse must pass through the two transfer stations to the disposal site. The firm receives a per-ton rate from the city of $4.65. This rate is fixed for the five-year period, thus ensuring cost control. This creates risk for both the city and the corporation. If costs exceed the per-ton rate, the corporation is placed in financial jeopardy. This will affect the service provided.

When one firm is given a regional collection contract, the private operator will often provide the disposal services too. This is especially true in semi-rural and rural areas, where land is relatively plentiful and disposal site location is less controversial than in densely populated urban regions.

In Baldwin County, Alabama, a single private company was able to negotiate a five-year contract with the county to provide a sanitary landfill operation. The firm charges a flat rate of $1.42 per ton, with a 20,000 ton per year guaranteed minimum delivery clause. Collection in this rural county is provided to 35 percent of the population by an association of ten private haulers. The remaining 65 percent either deliver to the disposal site personally, use a landfill on their own property or dispose of their trash illegally.

Before the late 1960's, firms providing either collection or disposal services were almost always small and limited to operating in a few communities. In the past few years, however, several large national solid waste management firms have developed. Mergers have accounted for the growth of these firms. The two or three largest have systematically purchased independent scavenger firms in widely separated localities. In so doing, they have inherited contracts already in effect with municipal governments.

Even these large national firms have not installed capital-intensive disposal systems. They use only sanitary landfill for disposal, and often own their own sites. Brief discussion with principals in two of these firms has revealed two reasons for this situation. First, landfill is almost always the least expensive alternative. Even if transportation over long distances is required, it is usually cheaper to use a landfill. Second, the technological risk associated with incineration or resource recovery is so large that no private operator can afford to innovate in this area.

Financing Considerations

These major firms -- no matter how sophisticated their service -- depend on standard corporate financing techniques: internally-generated funds, debt and equity. When a private firm secures a municipal solid waste contract and requires finance, the banking community generally studies several features of the situation:

- The capital structure of the firm.
- The capacity of the city to pay for the service.
- The length, adequacy and soundness of the contract.
- The quality of company management.
- The condition of the equipment to be used.
- The political stability and administrative practices of the municipality's local system.

There are disadvantages in the use of private contractors. The most important is the loss of control over the operation. This problem was acute in Hot Springs, Arkansas, where poor equipment, inconsistent service and constant street litter characterized the private system. Hot Springs is now attempting to regain control of its system through purchase of new equipment to lease to the contractor, ownership of the disposal site, ownership of the processing system, plus increased regulation of service frequency and quality.

Chicago was particularly concerned with its capacity to guarantee service. City officials believe that the city must exercise complete control over the system if they are to provide this guarantee.

In the cities visited during this study, contracting for disposal is viewed with considerable caution. If a contractor fails in business, or cannot settle a price dispute with the city, the closing of his site or processing facility can leave the community with major problems. It usually takes more time and more money to solve a disposal problem than a collection problem.

Observations

Use of a private corporation enables the municipality to transfer the economic and administrative burdens of solid waste management from the city to the firm. The corporation takes on the responsibility of raising capital. If the city is dissatisfied with results, it can change contractors.

The evaluation of private corporations as a financing vehicle is actually an evaluation of the ability of that corporation to raise capital to finance a solid waste system. The complexity of using corporations is mainly in the time required to draft and agree on a contract. It becomes more complex if a city's system must be discontinued and the employees discharged or reassigned. The ability to raise capital through a corporation depends on the corporation's financial strength. It is more difficult for a small firm like American Thermogen to raise capital to construct an incinerator than it is for a billion dollar firm like Combustion

Engineering. Nearly any amount of capital for a system can be raised by a large credit worthy corporation.

There appears to be no constraint on the use of corporations in this field. Corporations receive no subsidy for work in this field unless they finance their facility with a tax-exempt industrial revenue bond. This subsidy will encourage more corporate activity and perhaps more capital intensive systems because the cost of capital will be lower than the corporation's normal debt issues.

The corporations should not disrupt any investment or operational activities in solid waste, but rather should be a force to increase programs.

Non-Profit Public Corporations

The non-profit public corporation is similar in many respects to the authority as a means of financing and managing a solid waste system. Using this form of corporate body, the city can shift its financing requirements to an organization outside the immediate municipal bureaucracy.

The similarities between a non-profit public corporation and an authority include:

- Financing outside government debt limits.
- Avoidance of legal restrictions, such as the need for voter approval.
- Coverage for more than one political jurisdiction.
- Management flexibility.

Considerations in the Formation of a Non-Profit Public Corporation

The major reasons for a community to create a non-profit corporation rather than an authority to perform solid waste services are ease of administrative and legal approval and a long-term commercial interest in the service. The administrative and legal hurdles are less formidable and less formal than the formation procedures for an authority. The non-profit corporation can be established by the city or by a group of private individuals. The important consideration is that the organization is tax-exempt and can issue tax-exempt bonds. To gain tax-exempt status, the corporation must satisfy the following Internal Revenue Service criteria:

- The city council must approve the project and accept the assets after bonds are paid.
- The corporation must agree to give its assets to the city after bonds are paid.
- The city must provide all easements to the corporation at no cost.

- The Directors of the corporation must be city or state officials.

- The corporation must provide a public service.

The non-profit public corporation provides a less risky means to test a commercial idea than does a commercial operation. Using a tax-exempt bond issue, the public corporation can raise capital more easily, and at less cost, than could a private corporation using a taxable issue for the same project. If the service works effectively, the public corporation can organize its next service as a profit-making corporation.

In Nashville, a non-profit public corporation was formed to build an incinerator that could burn solid waste and sell energy generated in the processing. The venture is commercial in nature but it was formed as a public non-profit corporation in order to increase the saleability of securities in the market. Without the power to tax and thus use general obligation bonds, the most attractive issue for the non-profit corporation is the revenue bond. For a new system operated by a new company the revenue bond is the most reasonable method to acquire the needed capital.

Observations

A municipality has more control over a non-profit public corporation than it does over a profit-making firm. In Nashville, the mayor and several other local and state officials comprise the board of directors. The non-profit corporation does not pay real estate or federal taxes, and its capital financing can be offered as tax-exempt.

The disadvantages of this type of financing and management are that political influence may be exerted and flexibility lost. Members of the board of directors may take actions that are politically motivated, whereas in an authority, the board is frequently comprised of private citizens. The community may also lose flexibility once the institution is established. It is difficult to dismantle a public corporation even if a better service is available to the community from other sources.

The evaluation of non-profit corporations as a financing vehicle is quite similar to the evaluation of authorities because the non-profit corporation is established normally to provide services. Only when large amounts of capital are needed does financing take place. The establishment of the non-profit corporation is a complex process. The organization must be approved by another governmental body, and a staff must be hired to do its work.

This study did not uncover any non-profit corporations that were strictly "pass-through" financing vehicles like the Harrisburg Incinerator Authority.

The ability of the non-profit corporation to raise capital depends on its ability to secure contracts for its services, its performance of the service as well as any provisions in its charter which limit the type of debt or the amount of debt. The cost of capital to a non-profit corporation will depend on the type of debt issued and the performance of the non-profit. In theory the cost of capital to the non-profit corporation should reflect the degree of risk perceived in realizing revenues because it will not have the security of the full faith and credit of a community behind it. Hence there is incentive to make investments that are quite certain to work technically and to insure that services are covered, at least to the break-even point, by contracts.

Non-profit corporations are not widely used in solid waste, but there does not appear to be any constraint on their use. While non-profit corporations are not subsidized, their debt issues are. Hence there is no particular financial stimulus to form a non-profit corporation because authorities, city agencies and corporations (under present IRS rulings) as well as non-profit corporation, can arrange tax exempt financing.

The non-profit corporations should not provide any disruptions in solid waste systems.

Multi-Community Cooperatives

The multi-community cooperative is a system developed by one community to provide service to itself and several other communities. Harrisburg, for example, developed an incinerator with sufficient capacity to handle sixteen surrounding communities in Dauphin County. The purpose behind a multi-community cooperative is to achieve economies of scale because equipment is in constant use. It enables member communities to provide services not otherwise financially possible.

For this type of regional service, one city provides the leadership. The concept offers several attractive features. It centralizes waste processing and disposal, reduces the number of small, inefficient, environmentally unsound systems operating in the area, and offers options in solid waste handling not otherwise available to member communities.

But there are also drawbacks for some member communities:

- Loss of control over site locations.
- Loss of control over charges for use of system.
- Increased interest costs when the leading community is less credit-worthy than other members.
- Loss of autonomy in solid waste systems may expand to other government services.

In addition, many communities have long histories of mutual distrust that make cooperation in a regional effort difficult

There are also risks for the leadership community. In the Harrisburg, Pennsylvania, and the Braintree, Massachusetts programs, the surrounding communities decided not to take part in the project. In each case, the sponsoring community is carrying an incinerator with a capacity that greatly exceeds its needs. This means that the taxpayers in these communities are carrying a financial burden originally intended to be shared with other communities. Residents will continue to pay for the excess capacity until the surrounding communities use the system.

Observations

The multi-community approach, while not as popular as other types of operations included in this study, has sound application in solid waste management. First, urban communities with no landfill area and with limited opportunities for incineration would benefit from a regional arrangement where the options are broader. This approach enables one political jurisdiction to take the lead, while contractually-bound supporting communities indicate to the financial community that the service will be used and sufficient revenues generated.

The persistent problem in the multi-community approach is where to locate the sites for the landfill, the incinerator, or any major equipment. Disagreements on this point often undermine potentially sound regional schemes. This problem has occurred in New York State, in Westchester County, in the area surrounding Braintree, Massachusetts, in Memphis, Tennessee, and Harrisburg, Pennsylvania.

The evaluation of the multi-community approach as a financing mechanism is really an analysis of the community who will issue the debt in behalf of the other communities. The complexity of organizing several communities together is time consuming because each city council must approve the concept and the working agreements. The ability to raise capital will depend on the lead community's debt capacity and financial strength. When one community is raising capital for itself and other communities, its debt capacity can be strained. In Massachusetts, special legislation providing for general obligation bonds outside the municipal debt ceiling is available for any community that desires it. The community must apply to the state legislature to have an amendment to their financing laws enabling this expansion of their debt capacity. In one case, this activity required two months.

The cost of capital will depend on the community issuing the debt if it is a general obligation, or it will depend on the project if it is a revenue bond.

The constraints on use of the multi-community approach are dependent on the willingness of independent communities to work together and, in particular, to let one community take a dominant role. There is no subsidy presently that would stimulate use of this approach. The tax exempt financing available under this approach is also available to individual communities. This approach should not disrupt solid waste systems, but should encourage more efficient and better quality systems.

State Activities in New Organizational Patterns

We have presented the four types of organization used by municipalities for financing of solid waste facilities and equipment. While these organizations have been used exclusively by local governments it is possible that states may also be able to use them.

The state of Vermont, for example, is considering the construction and financing of regional solid waste facilities. The state could establish its own organization, regional authorities, regional non-profit corporations, and specific regional districts to be served by private corporations. Whether Vermont will actually move into construction and financing for regional facilities is not yet known. This activity has traditionally been the function of municipal government in the state. The legislature will act upon this proposal during its current session.

The concept of state construction, financing, and assistance in establishing operations is a sound idea, particularly for a state with a sparse population and no major cities (population 100,000 or more). The state has a broader tax and revenue base than any community. It can use its greater financing power and combine its financing requirements into a large issue than can one municipality. Individual communities benefit from the use of more technical skill and a lower cost of capital.

In Florida, the state chose another path for upgrading solid waste facilities. Brevard County plans to construct two transfer stations, purchase a shredder, and establish a landfill for the combined cost of $7 million. With considerable foresight, the county encouraged the state to pass a law in its behalf five years ago requiring all waste generators in the county to use the county's solid waste facilities. This requirement provides a quarantee of waste volume to the Brevard County operations and hence a predictable revenue flow. From this base of revenue, Brevard County will be able to use a revenue bond to finance the construction of the new facilities if they decide this would be effective.

In this case a state by enacting legislation, has provided the basis for improvement of a local transfer, processing, and disposal facility. The law guarantees usage, which facilitates financing. The state determined that it was best to work through the existing county government because the county has a broad geographic spread and is a logical region for solid waste service.

When counties decide to combine to make service more efficient, as in the Denver area, the state can pass appropriate legislation and can establish a separate organization to provide the service.

Summary

The establishment of separate organizations for solid waste has been primarily a local government effort. The communities have the solid waste problems and have traditionally organized to handle their problems. In Vermont, Colorado, and Florida, state legislation and state activity provided local governments with alternatives that had previously not been available.

Thus, organization for financing can be done at the municipal or the state level. There is little doubt that special organizational arrangements are quite valuable for combining municipalities into regional solid waste areas. The question of when regional approaches are needed is best addressed by the communities in that region or state. The question of who should initiate regional approaches, the municipality or the state, is best left to the political decision-making process in the state.

VI. FINANCIAL MECHANISMS/ ASSISTANCE PROGRAMS TO STIMULATE INVESTMENT

The results of this study indicate that most communities have not found it difficult to obtain funds for solid waste expenditures from capital markets, even for relatively innovative systems. Capital may be obtained in conjunction with other municipal capital needs. There seems to be a very efficient market for general obligation bonds, and especially tailored revenue bonds. Funding may also come from general revenues, or in the form of loans from banks or private firms. In short, a community is almost always able to raise investment capital for solid waste systems.

It seems worthwhile to point out once again that in raising capital funds, the nature of the project for which money is to be used does not necessarily determine success in the market. Rather, it is the way in which the financing mechanism structures the financial risk. The capital market place is only concerned with the "price of money" or interest rate, and the risk involved.

Nevertheless, there are two issues that deserve attention. The first is specific: the risk of investing in new technological systems. The second is more general: the efficiency of the overall municipal capital allocation process; and in particular the trade-offs that are made among capital projects, usually to the detriment of solid waste systems.

Research in both the public and private sectors reveals that in most municipalities the capital allocation process has short-changed the solid waste system. This is not surprising: investment in solid waste disposal has low visibility. Since most city managers prefer to invest in projects that are in the public eye, solid waste is usually low on the list of priorities. A new hospital generates more publicity and public approval than a sanitary landfill.

The federal government can, and often does, play a significant role in the allocation process of individual municipalities. Many current federal programs are specifically designed to stimulate municipal capital expenditures in certain "chosen" areas. The question is whether a more direct program for stimulating solid waste expenditures should be established at the federal level. This is obviously an important policy decision.

In the remainder of this chapter, several financial mechanisms will be examined in order to evaluate their potential for use if such a program should be deemed desirable. Many of these mechanisms would stimulate general municipal expenditures, and thus, indirectly, solid waste expenditures; others could be used directly for solid waste systems.

The criteria used to evaluate each new mechanism will be very similar to the criteria used in the evaluation of existing financial mechanisms. Some of the new mechanisms have only recently been introduced, some are still in the proposal stage or have never been used in the solid waste field. The criteria have been adjusted to reflect differences between existing and new mechanisms. For the most part, the difference is a matter of emphasis rather than kind. The analysis will be structured in the following way.

- Direct Investment Encouraged
  How effective is the subsidy? Does it stimulate investment? What are the benefits of this investment? (Negative investment incentives will also be examined.)

- Type of System Encouraged
  Does the investment stimulus direct dollars toward labor, or toward capital intensive systems? Will the investment affect the public/private mix? Will new or traditional technologies be favored? Will efficiency in system capacity be promoted?

- Planning and Management
  Will the investment vehicle stimulate comprehensive analysis? Will it provide incentives for efficient project management?

- Administrative Complexity
  What is the administrative process? What controls are provided project management? How does administrative complexity affect the investment decision?

- Equity
  What biases are created by each subsidy? Does a particular subsidy discriminate in favor of urban versus rural communities, or poor versus wealthy areas? How does the subsidy affect communities with and without systems?

Grant Programs

One of the more traditional financial mechanisms that could potentially be used to stimulate capital investment in municipal solid waste systems is the federal cash grant. Cash grants may be non-categorical, as in revenue-sharing, or may be used to subsidize specific aspects of capital and/or operating expenditures.

In this section, only categorical capital grant programs, funded by the federal or state government, will be considered. These are programs which provide cash transfer payments to municipal governments, for use in financing specific capital investment programs.

There are many ways to structure a grant program. The simplest, perhaps, would involve the government transferring to a municipality an amount of money equal to a certain fraction of construction and purchase costs of equipment and facilities, assuming they meet certain criteria. In this case, the municipality would not need to have approval from a federal administrator before purchase or construction, but would have to present evidence that an acceptable installation had actually been built. A more commonly used structure requires that a federal administrator approve a proposed project before funds are granted. In this situation, the responsible agency would have the opportunity to review, and perhaps to restructure, a municipal project.

Both types of grant programs have advantages and disadvantages. It is virtually impossible to evaluate these or other grant structures without first establishing the goals of the grant program. For example, requiring prior approval would be necessary if a successful program required inter-municipality coordination. On the other hand, if implementation speed is a high priority goal, the simplest grant system would be preferred.

In this section, several examples of existing governmental grant programs will be presented.

Although there are hundreds of such examples, the range of possibilities is covered in those selected here. An evaluation of the advantages and disadvantages of each grant program will then be presented. This discussion will focus on the potential impact that a grant program might have on municipal investment in solid waste processing and disposal systems.

The grant programs discussed in this section are:

- New York Environmental Quality Bond Act of 1972;
- Tennessee Annual Per Capita Grant;
- Federal Construction Grants: Water Treatment;
- Hill-Burton Grants.

New York Environmental Quality Bond Act of 1972

New York State, according to the terms of its 1972 Environmental Quality Bond Act, will invest $1.15 billion in water, air, and land resource development and protection programs. Of this amount, $175 million is to be used to "help municipalities bridge the dollar gap between current disposal methods and resource recovery systems." Grants will cover up to 50 percent of the capital cost of proposed systems, and applicants will be judged on the following criteria:

- Amount of solid waste generated.
- Extent of resource recovery, and market potential for recycled products.
- Urgency of the air/water pollution problems associated with current solid waste systems.
- Environmental soundness of the proposed program.
- Regional "fit" of community's resource recovery proposal.
- Potential for direct relationships with other public facilities; e.g., treating sludge from a sewage treatment plant.

Communities which are too small to support resource recovery operations can apply for 25 percent grants towards the purchase of "equipment or devices needed for environmentally sound land disposal systems."

The goal of this grant program is to foster the development of resource recovery systems. In this regard, however, it is interesting to note that the information circular distributed by the state in support of the proposed bond issue states that "...it is not known which recycling processes will prove to be the most economical and efficient for a given municipality..." It further states that "[communities] can choose from a number of resource recovery systems being developed or come up with a system of their own."

Obviously, the structure of this program requires a great deal of interaction between the grantor and the grantee. The state has provided a specific goal (resource recovery systems) and a set of criteria by which it plans to judge specific plans. Distribution of funds depends on the soundness of each municipality's plan.

As of this writing, no grants for solid waste have yet been made. In fact, no actual proposals have been submitted since not many months have elapsed since the voters approved the state bonds in 1972. Evaluation of this program, therefore, will not be possible for several years. On the basis of the program structure alone, however, it appears that:

- The program should result in significant capital investment, but the approval process may cause long delays. Many communities may defer all major solid waste investment until more information on "acceptable" systems is available.
- Capital intensive resource recovery systems will be constructed at the expense of other methods.
- Efficient system planning and management will be a direct function of the state's review capabilities.
- The program will be very expensive, and difficult to administer.
- The program is weighted in favor of urban areas that can plan and support resource recovery systems.
- Municipalities will be less likely to consider private firms.

Tennessee Annual Per Capita Grant

In 1970, the state of Tennessee passed a law that prohibited open dumping and required a state permit for any proposed disposal method. In conjunction with this permit system, the state appropriated funds so that it could provide an incentive for compliance with the law. The incentive is in the form of a state grant, paid each year to all municipalities that have been given up-to-date disposal permits. The amount of the grant is a function of the number of people that are being served by the solid waste disposal system. It is currently set at $.75 per capita, but the state solid waste office has indicated that an increase to $1.00 per capita is expected to pass the current session of the state general assembly. The amount is intended to cover approximately one-half of a community's disposal costs, and the use of funds is unrestricted within the solid waste disposal area.

This type of program structure minimizes the differences between grant applicants, since it does not aim to encourage construction of a specific type of facility. Each municipality is free to evaluate its own problems and to arrive at the most acceptable solution. Once this has been accomplished, receipt of funds is only dependent on continued operation of an environmentally-sound system. Of course, there is no requirement that the funds be spent specifically on solid waste capital investment. The funds could be used to meet a revenue bond interest and principal payment schedule, however, and thus would serve to guarantee a certain level of revenue flow.

Although the program has only been in operation a short time, municipalities in the state have an excellent compliance record with the permit system. State solid waste officials attribute this in large part to the grant program. The program has other characteristics as well.

- It has been relatively effective in stimulating investments in solid waste systems.

- It does not encourage the development of particular types of systems, has a neutral effect on public/private mix, and offers no incentive to municipalities to invest in new technology.

- It offers no special incentive for efficient and effective management.

- It will probably not be difficult to administer or implement.

- It has no preference between urban and rural systems.

- Money goes to systems that were already in compliance as well as to those which have raised their standards. It is thus less efficiently used than if aimed only at non-compliers.

Federal Construction Grants: Water Treatment

For many years, the federal government has had programs under which grant funds were awarded to municipalities to assist with the construction of water treatment plants. As of April 30, 1970, federal grants of about $1.4 billion had been disbursed under these programs. State and local governments and interstate commissions receiving these grants had constructed about 9,600 waste treatment projects at a total estimated cost of $6 billion.

To attempt an evaluation of a series of programs of this magnitude is far beyond the scope of this report, and fortunately, program evaluations have already been prepared by governmental agencies, private consultants, and congressional committees. These reports indicate that the programs have had both successes and shortcomings.[1]

For example, the U.S. General Accounting Office (GAO) has made several reports to Congress to the effect that the programs have helped to abate water pollution. Without the construction of the projects funded by the grants, according to the GAO, water pollution problems would have been far more severe in the areas served than they are. However, the GAO also points out several shortcomings.

- Many waste treatment facilities have been constructed in waterways where major polluters located nearby -- industrial and municipal -- have continued to discharge untreated and inadequately treated waste.
- The grants have been awarded on a "shotgun" basis: i.e., on a first-come-first-served basis, or as a function of readiness to proceed.

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[1] Report to the Congress. In U.S. General Accounting Office. Examination into the effectiveness of the construction grant program for abating, controlling and preventing water pollution. Washington, Comptroller General of the United States, Nov. 3, 1969. 164 p.

- No comprehensive programs have been designed to achieve specific objectives on individual waterways.

- A project dollar limitation was part of the program. This served as a negative incentive for the construction of regional facilities.

- Operation and maintenance problems have been widespread for many years in plants constructed with federal funds. As a result, these plants have operated at low levels of efficiency.

- Many of the funds awarded to municipalities were used for the construction of facilities to treat substantial quantities of industrial wastes.

All of these problems are characteristic of governmental grant programs. In order to carry on programs that do not have these deficiencies, great care must be taken to devise plans that fulfill concrete goals. Praising a program because without it things would be worse is at best misleading, and at worst a sad commentary on the nation's capacity to solve its environmental problems.

To attempt a reasonable analysis of the effectiveness of any program would require that the costs of alternative solutions be investigated. For example, in the case of water treatment plants, one alternative to the construction grants program would have been a program similar to the Tennessee "compliance" grant. Perhaps the same level of federal funding would have produced a greater level of municipal investment, had it included a compliance incentive. Before a comprehensive analysis can be made, however, it is necessary to establish the goals of a particular program. This question is especially relevant in the area of solid waste, where capital investment may not be synonymous with environmentally sound solid waste systems.

Hill-Burton Grant Programs

The Hill-Burton Program was established to assist states and municipalities in providing hospitals, public health centers, and out-patient and other health facilities. Two forms of assistance are provided: direct grants and guaranteed loans.

The federal share of an approved project may be as much as two-thirds of total eligible costs. With the exception of public health centers, land is not considered an eligible item for federal assistance. Some $3.8 billion of Hill-Burton grants have been distributed to nearly 11,000 hospitals and other kinds of health facilities since 1946.

State and local governments, hospital districts or authorities, and private non-profit organizations are eligible for funding. Funds are allocated among the states on the basis of population and per capita income. Private profit-making corporations are not eligible. Those regions with high population and low per capita income receive the highest priorities since it is the intent of the program to reduce the costs of health care for those who need it the most.

Grants are made after the state Hill-Burton agency and the regional HEW office make detailed reviews of applications. Applications include plans and specifications, which are reviewed in depth by the Hill-Burton technical staff for technical adequacy and conformance to regional plans. The applications for a grant must be filed before construction commences.

Discussions with the Massachusetts Hill-Burton office indicate that no attempt is made to discriminate among the types of agencies that submit applications. In other words, a private, non-profit organization is as likely to be funded as a public authority.

In allocating funds to specific projects, the Hill-Burton office attempts to provide relatively thin coverage to a number of projects, rather than full funding for a smaller number of facilities.

As in most federal programs, a great deal of disagreement exists about its effectiveness. Critics have pointed to half-empty hospitals, in smaller cities, built by local officials as show places and as an inducement to local doctors. Also, like most programs, once started it develops a constituency of vested interests that are resistant to change. The recent federal budget, which provided a zero budget for the program, noted that there is currently an oversupply of hospitals with too many empty beds. For example, the average hospital occupancy rate is down to 73 percent, whereas 85 percent is considered optimum in big hospitals.

Furthermore, the General Accounting Office concluded in review of the program that:

- Projects were often conceived in a crisis atmosphere, with little or no attention given to advance analysis of specific health care needs.
- Cost estimates were deficient and alternative sources of funds were not identified early in the planning process.
- Projects were delayed by federal review procedures, with the result an increase in construction costs.
- Grants stimulated construction of high-cost hospital facilities but did not encourage lower-cost interim or convalescent care facilities, or more efficient or more innovative forms of medical care.
- Projects were funded inefficiently, without attention to national health care needs by state and region.

Evaluation

Direct Investment Encouraged

Dollar for dollar, there is little doubt that a capital grant program will be more effective in stimulating municipalities to invest in a solid waste system than any other type of assistance program. This is true because when federal (or state) grant funds are available, a municipality believes it can get "something for nothing." In this context, it will undoubtedly attempt to get the largest grant it can reasonably expect.

Construction grant programs provide a cash payment equal to some fraction of total program cost. Thus, a dollar of municipal capital expenditure will buy a proportionately greater amount of investment. Generally speaking, a construction grant program will generate more absolute dollar investment than would have been the case if the municipality was not subsidized.

To understand this, imagine that a municipality has decided to invest in a solid waste processing and disposal system. The actual amount to be invested can be thought of as being an amount that will equate the marginal benefits to be obtained with the marginal cost. In other words, capital will be invested up to the point at which an extra dollar investment would be expected to yield less than a dollar's worth of output over the years. Now add a construction grant program. For each dollar invested by a municipality, perhaps two dollars will be invested in the solid waste system if it is a matching grant program. The municipality's effective cost has been cut in half. To put it another way, the benefits for every dollar invested have been doubled. Under these conditions, the total capital invested in a project will increase. If the municipality reduces its own dollar investment by less than one-half, the total investment in solid waste capital will rise.

However, there is another side to the issue of direct investment. This involves timing. From a theoretical point of view, a grant program should not influence the speed with which a municipality implements investment in a project. Yet much experience with grant programs indicates that the very presence of the program does cause long delays and continual postponements in municipal project initiation. There seem to be several reasons for this.

First, every region close to the point of making an investment will wish to take advantage of the grant program. Thus, as soon as they suspect that a federal grant program is underway, they will delay planned projects until funds are available. This may take several years, of course. For example, the General Accounting Office in an evaluative report on the waste water construction grant program concluded that federal funding had not been adequate to meet the demands of municipalities. Most areas refused to start their project until they had received a grant, resulting in the delay of many construction grants.

Second, grant programs usually require applicants to submit extensive engineering, technical, financial and social data to justify the project. These administrative procedures not only increase direct costs, but also result in delays in project implementation. Delays occur on both sides--in preparation of the grant application and subsequently in its review and modification when necessary.

One of the most unfortunate aspects of the timing problem is that construction and land costs tend to rise over time. When the project is finally funded, the facility may be no larger than initially planned but significantly more expensive. What also may happen if inflation has not been accurately predicted is that the planned system may have to be cut back during construction. When this happens, the reduction in expenditures may reduce the usefulness of the system. Often when construction has started there is little choice as to what aspects of a particular project can be dropped. Careful preliminary planning goes out the window.

To summarize: federal capital construction grants may prove effective in stimulating dollar investment in solid waste systems, but the impact of the factors described above should be carefully weighed against this effectiveness.

Type of System Encouraged

One of the main disadvantages of a capital construction grant program is that an artificial incentive is created that affects the choice of a system. Because the municipality's share of federal funds is a function of the capital cost of the proposed system, it is obvious that an incentive to build capital intensive systems exists.

This characteristic might manifest itself in the solid waste area by causing an increase in the number of incinerators installed. A community will be able to build an incinerator for perhaps 50 percent of its "real value." Since a typical incinerator might be expected to last for 20 years, a community would favor this long-term investment over equipment that might have to be replaced within a shorter period.

Depending on how a construction grant program is structured, the subsidy may discourage regional solid waste solutions. If grants are awarded with no requirement for a regional approach, there will be a tendency for each individual municipality to construct its own facility. This tendency already exists and will only be augmented by the subsidy since it would either reduce the municipal capital investment required or, conversely, enable them to purchase a larger or more elaborate system with the same investment. This particular effect was characteristic of the Hill Burton grant program. It was found that the existence of the large capital construction subsidy encouraged many small towns to build their own hospitals when it was clear that a regional solution would have been more economically efficient. Of course, this does not necessarily have to happen. If grants are awarded so that only regional approaches are acceptable, as is the case with the water treatment facility grant program, the subsidy could be used to expressly encourage regionalization.

Another serious disadvantage of a construction grant program is the incentive created to invest in systems that are too large for one municipality. A municipality may be anticipating either population growth or an increase in waste generation per capita. It would like to construct a system large enough to handle the expected load now, when federal funds are available. It is very difficult for an administering agency to control this tendency. Planning an efficient system, in terms of future needs, is difficult at best. There is no way to eliminate a municipality's bias. This problem is also aggravated by the fee structure used by the engineering profession. When fees are a function of dollars spent, there is certainly a strong motivation to design the biggest and most expensive system that can be justified for an area. In fact, it has already been pointed out that most recently installed capital intensive systems seem far too large for the area served. A construction grant program may augment this tendency.

It is also clear that the availability of funds from a construction grant program deters a municipality from utilizing a private firm for solid waste processing and disposal. Unless there were a grant program available to private firms, municipalities using a private contractor would realize increased costs compared to a grant supported system. The municipality would be passing up potential grant funds unless it built the facility and then leased it to a private concern for operations.

There is one advantage to a construction grant program: a community is more likely to invest in new technology when federal funds are available. The risk to the community is reduced to the extent that the project is funded with outside capital. Of course, it is also possible to tailor a grant program so that certain kinds of systems will be built. The New York State Grant Program, aimed at resource recovery, is a good example of this level of system specificity. This approach has a major disadvantage, however. Many areas may decide to install the type of system specified in a grant program simply to get their share of grant funds, although the system is not suited to their needs. Thus, a disincentive for an efficient system is actually created.

Planning and Management

Construction grant programs stimulate system planning at the local level more than other state or federal assistance programs. The incentive is essentially the grant itself. In order to qualify for most programs, it is usually necessary to submit a formal proposal that spells out the municipality's problems in detail and tells how the proposed system will deal with them. Unfortunately, however, more effort may be expended to sell the project to the controlling agency than is spent on hard analysis.

Because of the artificial incentives that exist for specific capital intensive systems, the municipality is inclined to pick the system and then attempt to justify its choice. If the controlling agency wishes to "push" one system, it will actually encourage the type of "analysis" in which the conclusions are pre-ordained.

It is rather difficult to comment on the incentives established for systems management once the construction phase of a grant program is over. There is some evidence that poor management and inadequate maintenance are characteristic of projects that have been financed with federal grants. It is cheaper for a community to build a system with excess capacity and to provide minimum maintenance, than to construct an optimized system and follow up with adequate maintenance. For example, one study of federal transportation subsidies found that the optimal lifetime of a bus in Chicago and Cleveland was cut in half by the existence of a 66% purchase grant program.[1] Much undoubtedly depends on the specific system and the opportunities for capacity-operating expense trade-offs. An example of this problem in solid waste might be an incinerator with enough excess capacity to allow a furnace to be held in stand-by. Rather than provide regular maintenance, the municipality might wait until a furnace breakdown occurs and then switch to the stand-by furnace while repairs were made. There are many other examples.

Administrative Complexity

A construction grant program is undoubtedly the federal assistance program that requires the most complex administrative control system. Most federal program structures would require the preparation and review of elaborate system proposals. If a regional, state or national goal is to be encouraged, the way that individual systems interact must carefully be evaluated. It is in this respect that many grant programs have been considered lacking.

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[1] Tye, W. B. The capital grant as a subsidy device: the case study of urban mass transportation. In The economics of Federal subsidy programs; a compendium of papers. pt. 6. Transportation subsidies. Washington, U.S. Government Printing Office, 1973. p.796-826.

Further, unless grant funds are unlimited it must be expected that a queue of project proposals will develop. When this occurs, unless an efficient method of project ranking is available, the allocation of funds may be made on a first-come-first-served basis. Certainly this method of allocation is inconsistent with efficient resource allocation.

Equity

Two kinds of equity issues are associated with a construction grant program. The first is the distinction that must be made between urban or semi-urban systems, on the one hand, and rural systems, on the other. For solid waste disposal systems, it seems clear that only urban or semi-urban areas would benefit from a facilities and equipment construction grant program. Only in these areas are capital intensive systems ever needed. The per capita cost of a solid waste system is a function of the density of the area to be served. So federal assistance per capita will clearly be higher for densely populated urban areas than for smaller, or rural, communities.

The second equity issue centers around the practice of giving assistance to communities which have done little or nothing to comply with federal and state laws. In this instance, municipalities that have already installed environmentally sound systems are penalized. Of course, this type of grant program may be favored, since more money can be directed to problem areas than in other types of programs.

Credit Banks and Loans

Another method for stimulating municipal expenditures in the field of solid waste is the use a governmental, or quasi-governmental, intermediary to do the financing. The intermediary (e.g., a credit bank) collects the debt requirements of a number of communities and goes into the market with one large issue. After the bonds or securities have been sold, the intermediary distributes funds to the municipalities.

The major advantage to the communities involved is that the interest rate is lower for participants than it would be if each municipality issued its own bonds. An additional advantage is the availability of financing to municipalities who, through lack of experience, are not familiar with the methods of raising investment capital.

The average interest rate is lower when one agency holds a portfolio of bonds because the risk is less than for a single community's issue. By being able to issue a large number of bonds at each maturity, the credity bank's issue will appeal to a wide spectrum of potential investors. Large institutional investors usually do not like to buy just a few bonds of one maturity. Of course, each municipality will also realize a savings in transaction costs, since it will not need the services of an individual bond underwriter.

The intermediary that performs the financing can be a state agency, a federal agency, a regional agency, or a quasi-public agency like the Federal National Mortgage Association. Bond banks, credit banks, and loan programs are the most prominent sources of this type of financing.

In this section, several different institutional approaches to this form of financing will be described. Each financing method will be evaluated in terms of its usefulness in providing funds for solid waste facilities and equipment.

The credit banks and loan programs to be discussed as examples of this concept are:

- Vermont Bond Bank.
- New York Environmental Facilities Corporation.
- Federal National Mortgage Association.
- Environmental Finance Authority (Department of the Treasury).
- Urban Development Bank.
- Farmers Home Loan Program.

This is not an exhaustive list of financial intermediaries, but it represents the major types. An analysis of the accomplishments of each program will focus on the type of investment stimulation each brings to the solid waste field.

Vermont Bond Bank

The Vermont Bond Bank was established to pool municipal debt issues from a number of small communities. Generally, the debt issue of small municipalities had been of interest only to local banks. The bond bank combines local issues into a single state-sponsored issue. The bonds are backed by the tax power of the local government, and by a reserve fund maintained by the bond bank. Although state bank bonds are not the obligations of the state of Vermont, the state legislature has the power to fund any deficits in the debt reserve fund. This legislative power provides a "good faith," or moral, guarantee for the bonds, and most investment bankers believe that deficits would be covered by the state.

In December 1970, the Vermont Bond Bank issued $46 million in general obligation bonds, the proceeds of which were used to purchase the securities of 48 small towns and local districts. Half of these municipalities were borrowing $500,000 or less. The interest cost for the issue, compared with average interest costs for fifteen individual community issues in Vermont for the same time period, represented a savings of 50 basis points, or about $3 million over the life of the issue.[1]

The Vermont Bond Bank has three primary characteristics.

- Its issues provide a cost-of-capital saving for all participating municipalities.
- It provides capital formation for small towns with limited access to, or knowledge of, capital sources.
- It is completely neutral in the program investment of the funds; it does not encourage or discourage investments in solid waste.

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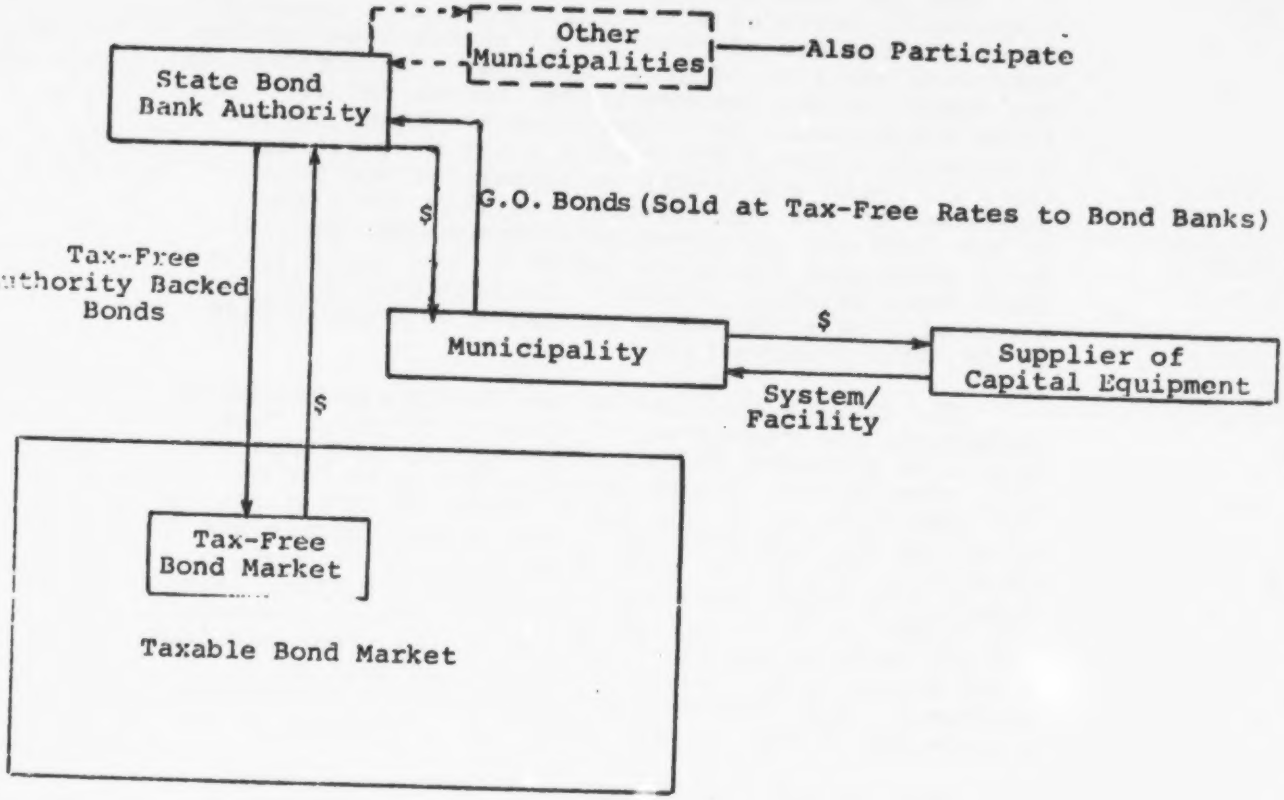
[1] Results of bond sales. Daily Bond Buyer, 214(23516):23, Dec. 22, 1970.

Figure III-1

STATE BOND BANK

(Vermont, New York)



Other Municipalities
Also Participate
State Bond Bank Authority
$
G.O. Bonds (Sold at Tax-Free Rates to Bond Banks)
Tax-Free Authority Backed Bonds
Municipality
$
Supplier of Capital Equipment
System/ Facility
$
Tax-Free Bond Market
Taxable Bond Market

New York Environmental Facilities Corporation

The New York State Environmental Facilities Corporation provides financial, technical, construction, and managerial services to communities needing help with their solid waste systems. The corporation can issue its own revenue bonds, or can secure bank notes which enable it to purchase the bonds issued by municipalities. The municipality must pledge its full faith and credit in support of the bonds purchased by the Corporation. Neither the state of New York nor the communities themselves specifically guarantee the bonds issued by the corporation. There does exist an implicit understanding that the state will back the bonds by making up deficiencies in the debt reserve fund.

The EFC has assisted in the design, construction, financing, and management of three projects. They have also provided technical consulting services to many communities. These services are paid for by the community, at a rate negotiated with EFC which is generally in line with the rates charged by private consulting firms. In this area, the EFC is in competition with consulting engineers and other legal and financial firms in the private sector. Frequently, the EFC contracts with corporations for these services. Pope, Evans, and Robbins, a firm of consulting engineers, designed the landfill/recreation area for Brookhaven, Long Island.

EFC has not issued any bonds nor has it ever purchased any municipal bond issues. Its major method of financing is the use of short-term notes which are "rolled-over" to provide medium-term financing. These notes provide financing for a specific solid waste or other type of environmental project in a given community. They are arranged by EFC's director of finance.

The EFC has established a network of banking relationships throughout the state and can place notes in any one of a number of banks. A note is placed with a particular bank after the EFC has called several to determine the most favorable interest rate obtainable for the community in question. In raising money for a large project like the Brookhaven landfill, most banks are only willing to accept short term notes issued in anticipation of a later bond issue.

The complete package of services provided by the EFC is impressive. If a community accepts EFC's approach, the corporation will take over the solid waste problem, solve it, and manage the operation. Furthermore, the service carries the implicit support of the state.

One advantage EFC has over a general bond bank like Vermont's is its specialized program for environmental systems. Its financial and service activities are available to assist a community in the complete solution of an environmental problem. The very existence of the EFC should stimulate communities to initiate projects and improvements in solid waste facilities and equipment.

The EFC selects those projects it is interested in supporting so state control can be exacted through this organization. With its specialized knowledge in solid waste and other environmental concerns, the EFC is well suited to invest capital wisely and more efficiently than an all-purpose bond bank.

Although the EFC provides financial and technical support to a community, it is not a lender of last resort. If several communities desired assistance from EFC, and the corporation did not have the funds or services to serve all requests, the marginal projects would be excluded.

In review, EFC has some very interesting features.

- It stimulates investment of environmental facilities through its promotional work, technical advice, and financing.
- It is neutral in stimulating expenditures; solid waste is not preferred over other environmental investments.
- It can organize and provide technical and financial services not otherwise available to smaller communities.

- Through the range of its services, it is likely to encourage efficient use of municipal resources.

Federal National Mortgage Association (FNMA)

The Federal National Mortgage Association is a public corporation, wholly owned by holders of its common stock. Chartered in 1938, FNMA provides support for the secondary mortgage market by buying and selling residential mortgages originated by mortgage lenders. Its major purpose is to broaden the market for mortgages by enabling primary mortgage makers to clear portions of their holdings periodically, thus making a continuous supply of money available for mortgages.

FNMA provides added liquidity to the mortgage market in two ways: (1) by purchases and sales of existing mortgages, and (2) through efforts to standardize mortgage documents to aid development of a national mortgage market. The first function is similar in intent to the function of a market-maker in securities, with an important exception. FNMA buys much more than it sells, due to its concern over adverse effects on interest rates of large-scale mortgage selling. FNMA has engaged in heavy selling in only one of the last eight years. Thus, FNMA does not really provide a full secondary market mechanism.

In the four years since the 1968 Housing Act transformed FNMA from a governmental agency into a private corporation, the association has tripled in size.[1] As a public corporation, whose stock is traded on the New York Stock Exchange, FNMA has been regarded as a very volatile ("hot") stock, primarily because of the tremendous financial leverage allowed the corporation. The allowable ratio of debt to equity, recently raised to 25-1, far exceeds that of any other major financial company in the U.S.[2] The major source of its profits is the difference between the long-term mortgage interest rates it charges and the low interest rates it enjoys in the capital market (low because it has the borrowing status of a government agency).

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[1] Breckenfeld, G. Nobody pours it like Fannie Mae. Fortune Magazine, 85(6):88, June 1972.

[2] Breckenfeld, Nobody pours it like Fannie Mae.

It is interesting to note that its borrowing status is a market perception only, because FNMA's notes and debentures are not actually guaranteed. To further enhance the FNMA credit rating, Congress authorized the corporation to borrow up to $2.25 billion from the U.S. Treasury in an emergency.

Although there are similarities between the problems of the housing mortgage market and the municipal securities market, there are significant differences which render an FNMA-type mechanism impractical and unlikely to receive legislative support, either for municipal bonds in general or solid waste financing in particular.

The major source of profit which contributes to FNMA's "swinging" image and growing public support is not available with municipal securities. If an FNMA-type organization were to purchase municipal securities at tax-exempt interest rates, as opposed to housing mortgage rates, the spread between interest received and paid out would vanish and quite likely result in a loss.

In review, the FNMA "concept" may be assessed in the following manner, in terms of its applicability for solid waste:

- FNMA purchases debt from primary holders of debt and not directly from debtors; hence it is a market-maker rather than a credit bank.
- The concept, then, only applies to the municipal bond market. This market is well organized institutionally. It has primary and secondary markets and has substantial new-issue dollar volume (over $22 billion in general obligation and revenue bonds in 1972). The institutions have a known capacity for market making.
- The adaptation of the FNMA concept to solid waste would require a cash subsidy to cover losses, or expenses not covered when purchasing municipals with yields that are lower than or equal to the FNMA cost of capital.

- FNMA does not serve the same function as a credit bank, thus the concept is not applicable in that role and the market in municipal bonds has proven capacity to do what the FNMA can do.

- If the goal is stimulation of solid waste investment, or greater market access for solid waste municipal bonds, the FNMA concept does not provide the best mechanism for achieving this end.

Environmental Financing Authority (Department of the Treasury)

The Environmental Financing Authority, created by the Federal Water Pollution Control Act of 1972, is a federal refinancing mechanism to assist states or municipalities with the financing of the non-federal share of waste treatment works. With certain stipulations, the authority is empowered to purchase obligations of states or municipalities at interest rates which approximate current market yields on Baa municipal bonds.

The Authority is envisioned as a "lender of last resort." It exists to assist communities who cannot obtain long-term funds at reasonable interest rates. Acceptable projects are those which are eligible for federal financial assistance under the Federal Water Pollution Control Act. Before any commitment is made by the Authority to a state or municipality, the administrator of the EPA must: (1) certify that the community is unable to obtain credit on reasonable terms; (2) approve the project as eligible under the Federal Water Pollution Control Act; and (3) agree to guarantee timely payment of principal and interest on the obligation.

Although the Authority is still in the development stage, officials have stated that interest charges will vary with the market at the Baa rate. It is expected that approximately 20-25 percent of federally-approved waste treatment facilities will be refinanced through the Authority.

To finance its operation, the Authority, with the approval of the Secretary of the Treasury, may issue bonds at taxable rates. Losses, resulting from purchasing at tax-free rates and selling at taxable rates, are made up from the U.S. Treasury.

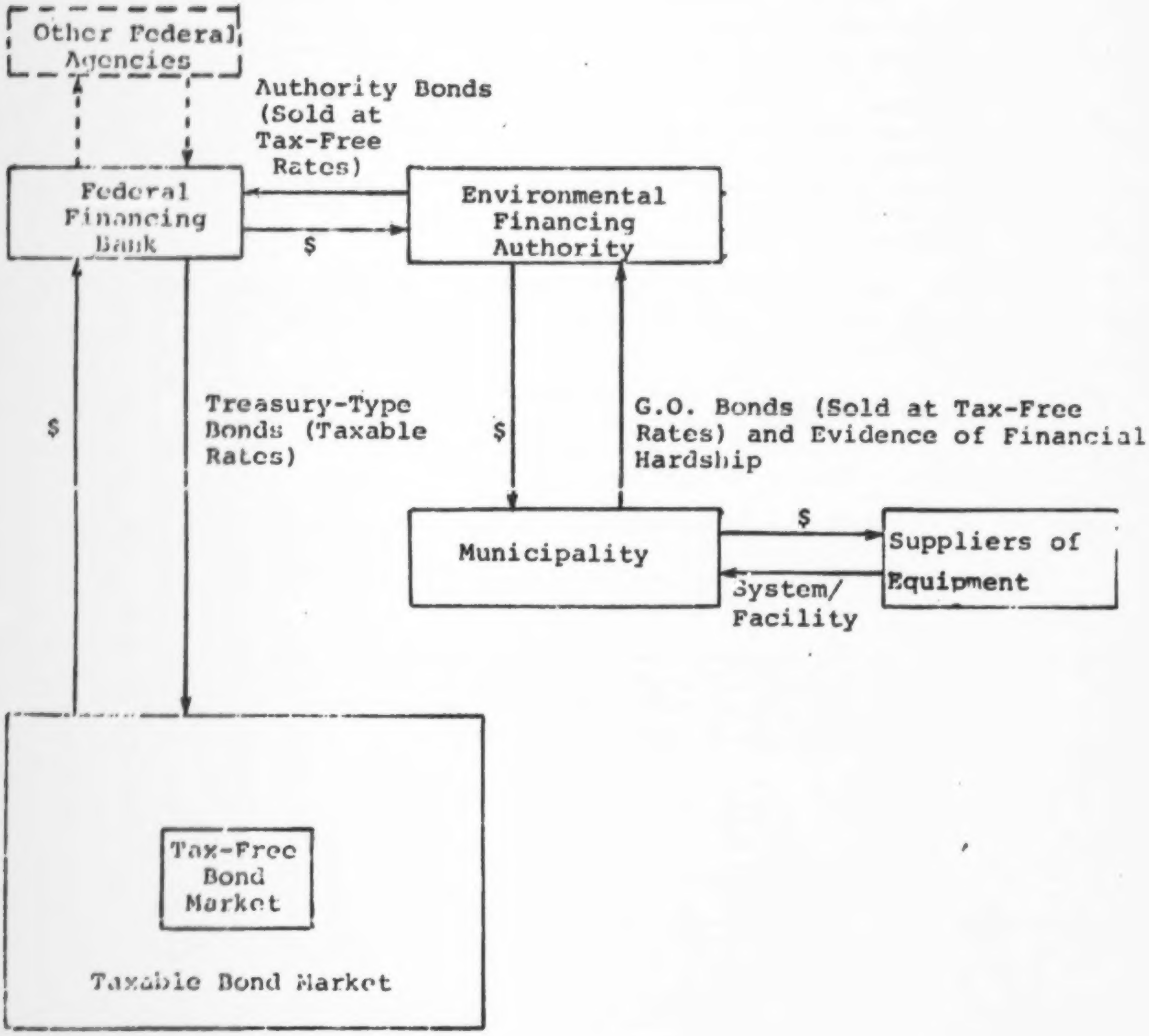
Under the proposed Federal Financing Bank Act (S.3001), a Federal Financing Bank would be established to purchase the obligations of federal agencies, such as the Environmental Financing Authority. This would relieve the Authority of taking its securities to the market place. The Federal Financing Bank would provide a coordinating function among all federal agencies, to facilitate refinancing at the lowest possible costs. The Bank would be empowered to issue its own obligations in order to cover purchases from the participating federal agencies.

The EFA concept is better suited to municipal solid waste financing than other refinancing mechanisms, primarily because it is designed to help only those communities which cannot get financial assistance from any other source. This places maximum responsibility on individual municipalities to finance their own projects, and results in more efficient decisions relating to individual systems. (See Figure III-2 for a generalized flow diagram of the EFA.)

The main characteristics of the EFA in the Department of the Treasury can be summarized as follows:

- It stimulates investment in environmental facilities by insuring municipalities of access to capital for environmental projects.
- EPA will provide a review and certification process prior to EFA financing thus providing a greater likelihood of sound investment; and
- It supports projects in smaller, more "credit-risky" municipalities, thus providing disincentives toward more efficient regional projects.

ENVIRONMENTAL FINANCING AUTHORITY/ FEDERAL FINANCING BANK


Other Federal Agencies
Authority Bonds (Sold at Tax-Free Rates)
Federal Financing Bank
Environmental Financing Authority
$
$
Treasury-Type Bonds (Taxable Rates)
$
G.O. Bonds (Sold at Tax-Free Rates) and Evidence of Financial Hardship
Municipality
$
Suppliers of Equipment
System/ Facility
Tax-Free Bond Market
Taxable Bond Market

Urban Development Bank

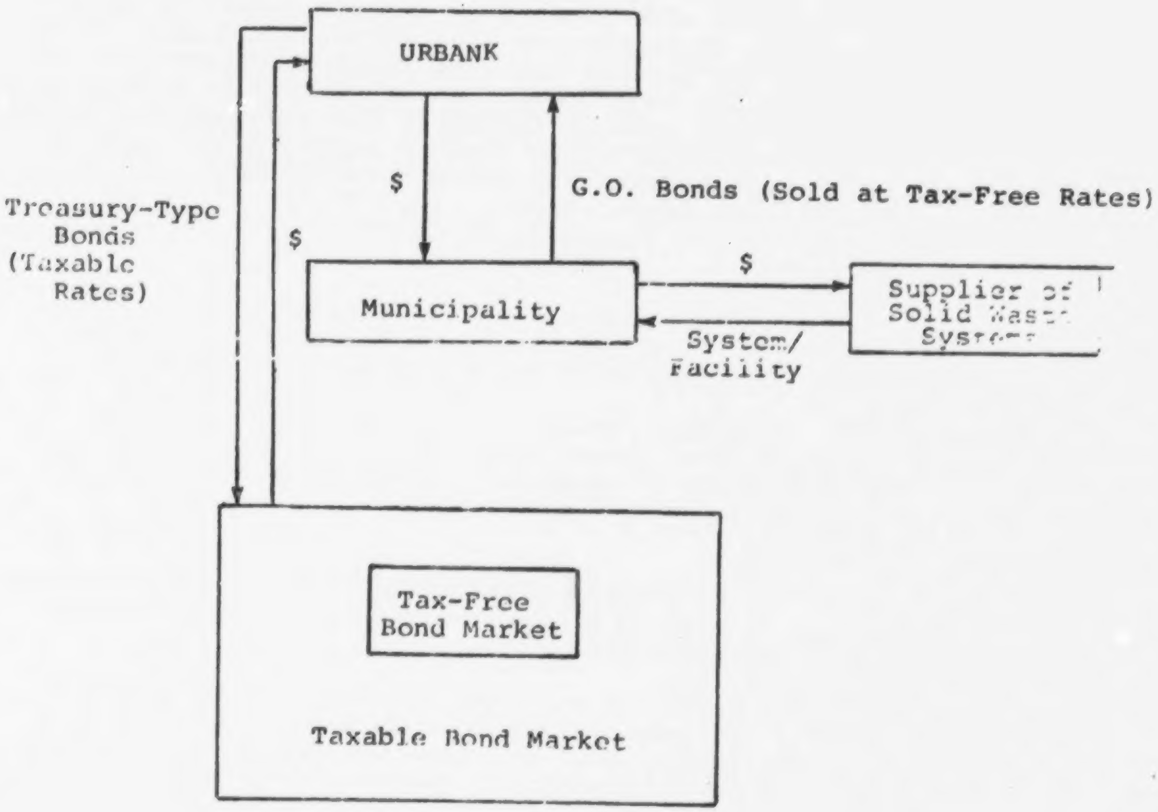
The Urban Development Bank (URBANK), as proposed in July, 1968, would be a non-federal corporation owned by states and cities. Urbank would issue taxable bonds backed by the full faith and credit of the U.S. Government and would use the proceeds to make loans to states and municipalities. These loans would be made at one tax-exempt rate, thus encouraging communities with lower than average credit to apply. An annual appropriation from the U.S. Treasury would make up the capital loss the corporation sustains by lending at a lower rate than it borrows. In addition, Urbank would provide technical and planning assistance, and perhaps investment banking services, to some communities. Fees charged for these services would be used to cover operating costs. (See Figure III-3 for a generalized flow diagram of the URBANK financing mechanism.)

URBANK would meet a broad range of municipal financing needs and would thus provide capital for major investments in any municipal program area.

Although URBANK is an interesting concept, a review of its services reveals the following limitations, in terms of its applicability to solid waste:

- The subsidy provided by URBANK is non-categorical. There is no impact on the municipal capital allocation process.
- URBANK's low cost of capital will appeal to poorly credit-rated municipalities. It may tend to encourage capital intensive investments and to discourage regional projects.
- To the extent that URBANK stimulates capital intensive projects, it is likely to create operating problems of a technical and financial nature for poorly-managed communities.

URBAN DEVELOPMENT BANK (URBANK)



Farmers' Home Loan Program

The Farmers' Home Administration[1] makes loans and grants for the construction and/or improvement of water and waste disposal systems which primarily serve farmers, ranchers, farm tenants, and other rural residents. In this section, the discussion will concentrate on the loan program which constitutes 72 percent of total fiscal year 1972 disbursements.

Eligibility for this program is limited to municipalities with less than 5,500 residents, or quasi-public bodies which serve residents of these towns.

The loans are repayable over periods up to 40 years, with annual interest not to exceed 5 percent. There were 1,327 loans made in fiscal year 1972, totalling $261,703,930.

The loan program has the following features that can apply to solid waste:

- Small municipalities have access to capital at low interest cost.
- The Farmers' Home Loan Program stimulates investment in waste disposal for small communities and encourages regional arrangements.
- The application and award process is not more difficult and time-consuming than, for example, a revenue bond issue.
- The loan program does not encourage extensive analysis, nor do small municipalities have the ability to perform sound analyses.

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[1] At the time of this writing, the 1974 federal budget contains no appropriations for this program.

Evaluation

Credit banks and loan programs are analyzed together because they perform similar services for eligible municipalities. The community turns its request for funds over to the credit bank or loan agency, and this intermediary raises funds that are distributed to the municipalities. The municipality never directly enters the market nor does it examine alternative financial mechanisms. The intermediary performs this function in behalf of all participating communities.

Direct Investment Encouraged

The credit banks, and loan programs of this type, provide a direct subsidy to municipalities. In all cases small-sized municipalities are likely to acquire lower interest costs for their project, hence encouraging more program investment. However, the incentive to invest is not directed to any specific program area. In the case of the Vermont Bond Bank or URBANK, the incentive is spread across the full range of municipal services. Solid waste does not have a higher, or lower, priority than any other municipal program.

The situation is somewhat different in EFC, EFA, and Farmers' Home Loan Program. The subsidy (in the form of lower interest costs) is directed specifically to environmental projects. Thus, competition for funds is reduced, although some still exists. Solid waste investments will be a direct function of their priority (versus air, water, and other environmental needs) in a given political jurisdiction.

It should be noted that the pooling of projects does not always guarantee a lower interest rate for all participating municipalities. For example, large and wealthy communities like Westchester County in New York may issue their own debt at an interest rate equal to, or less than, the rate of an EFC revenue bond. The Vermont Bond Bank and EFC do not have the full-faith-and-credit backing of their respective states, while a high quality community issuing general obligation bonds does have this added security.

Type of System Encouraged

The subsidy level provided by credit banks and loan programs is so small as to have very little impact on municipal solid waste investment. However, among the various types of credit banks and loan programs, those that provide a project screening and review process may encourage better system planning at the local level.

It is also unlikely that credit bank or loan programs will directly affect the public/private mix in solid waste. A municipality must first decide whether it prefers a public or private system. During this deliberation, it is unlikely that an interest savings of .5 percent of 1 percent would be the major incentive to shift from a private system to a public system.

It seems more likely that once a community decides that a public system better meets its needs, the use of a credit bank is then viewed as a simpler and less costly way of raising funds.

Finally, the credit bank or loan programs would not have any particular effect on designing and building efficient capacity systems or for stimulating investment in new technology. Capacity decisions (from the field survey) are dependent more on population projections and other community usage than on incremental dollar cost of per ton added capacity. Also, the subsidy level is too small to significantly reduce the risk of experimental technology.

Planning and Management

Credit banks and loan programs, in and of themselves, do not provide incentives for sound planning and management. On the other hand, if a particular subsidy mechanism provides planning assistance in addition to reducing the cost of capital, a community's planning process will be enhanced. Of course, technical assistance could be provided in the absence of either a credit bank or loan program. Essentially, the financial subsidy provided by these programs is too small to appreciably influence the quality of the management process.

Administrative Complexity

A straight loan program like Farmers' Home Loan Program offers some advantages if ease of administration is the most important goal. When a community determines its need for capital, it applies for a loan. Within 30 to 90 days, it will have the money. Beyond a preliminary screening, the municipality need expect little intervention in the management of the project, unless payments are not made. Farmers' Home Loan Program legal and analytical activities are minimal.

Credit banks involve a little more administrative complexity. When a municipality desires to work through a credit bank, it must wait until other communities have a need for a bond issue. The time it takes for a credit bank to collect enough debt issues to warrant a bank bond issue ranges from a few months to a year. Whatever the time, it is out of the municipality's control.

The actual time needed to process the request for issue is minimal; it is the time required to pool a sufficient number of requests to make a viable bond issue that is the procedural albatross.

The amount of direction given to the individual community after the bond is issued is minimal. A schedule of payments is set up, and only if payments are missed will the credit bank become actively involved with the community.

EFC will become more involved with the project and with community payment if it manages the project. But, this service activity is in addition to financing. The financing itself does not prescribe this form of control.

Equity

The workings of credit bank programs tend to avoid any form of discrimination in terms of preference toward certain size cities, or urban versus rural areas, or municipalities with systems or municipalities without systems.

The credit bank enables small communities to pool their capital needs, so obviously the concept works in their favor. In fact, the Vermont Bond Bank stresses this point. In New York State, with its mixture of large and small communities that are rich and poor, urban and rural, the EFC does not appear to prefer any particular type of community.

The only form of bias is towards municipalities that require equipment-intensive programs. Communities wanting to finance landfills are not likely to use the credit bank, simply because pay-as-you-go can generate the needed cash. The interest subsidy provided by a credit bank tends to favor the community that needs a more capital intensive solution. In practice, this form of inequity appears to be very minor. The Vermont Bond Bank experience points out that very small communities need to use, and do use, the services offered by a bond bank.

Interest Subsidies and Loan Guarantees

A third set of mechanisms that could be used to encourage municipal investment in solid waste are interest subsidies and loan guarantees. Since they have similar characteristics, they will be treated together. Loan guarantees are designed to reduce the risk of default to the lender, and, as a result, to lower the interest rate to the borrower. An interest subsidy, obviously, lowers the effective interest rate to the borrower more directly.

There are five generic forms of interest subsidies that can be used to stimulate municipal investment. Two of these have been discussed in the credit bank section. One is the direct loan at below-market interest rates (e.g., Farm Home Administration loans, which are available to all small communities regardless of risk). The second is the type of program which makes loans to municipalities having difficulty getting capital because of credit problems (e.g., EPA). This section will focus on the three remaining interest-subsidy options.

First, the subsidy can take the form of a simple cash payment from the government to either the lender(s) or to the municipality. The cash payments may be equal to part or all of the interest charges. Control over project selection may be achieved by requiring the borrower to submit his capital program plans prior to authorization of the subsidy. An example of a cash payment interest subsidy is the interest reduction payment program administered by the Department of Housing and Urban Development.

A second form of subsidy is provided by the government when it guarantees all loans made to municipalities. This form of subsidy has less impact than direct cash payments. Here, the effect is to bring interest rates charged to municipalities to the level of equivalent-term, tax-free government securities. It is doubtful that rates would adjust by more than 1 percent and, in the case of Aa rated municipalities, perhaps .5 percent, at most.

Finally, the interest subsidy may take the form of a fund to insure lenders against default. One or both parties contribute to such a fund. If premiums are set sufficiently high to cover all settled claims, the net effect on interest rates is similar to that of a loan guarantee.

Many variations are possible in the design of interest subsidies, under these three generic forms. This section will discuss three representative examples of the interest subsidies. Each subsidy program will be evaluated in terms of its usefulness in the financing of solid waste facilities and equipment.

The subsidy programs to be discussed are:

- Municipal Capital Market Expansion Act (S.3215);
- Government National Mortgage Association; and the
- Hill Burton Program.

Municipal Capital Market Expansion Act (S.3215)

In February 1972, this bill was introduced in Congress to provide a federal interest subsidy to any state or municipality choosing to issue taxable securities. To offset the higher cost of these securities (compared to tax-exempt bonds), the U.S. Treasury would make a direct cash payment to the issuer equal to one-third of the interest cost. Thus, a municipality could choose to issue a taxable or tax-exempt bond, depending on which offered the lowest cost of capital. The additional tax revenues realized by the federal government from the issuance of the taxable securities would be used to cover the costs of the subsidy.

Under this program, the subsidy rate of 33-1/3 percent is designed to bring taxable bond interest rates equal to those on tax-exempt bonds. However, supporters of this bill estimate that additional federal tax revenues could produce a net gain for the Treasury. This could be transferred to the states and municipalities in the form of increased subsidies. Whether or not this gain is realized will depend upon the average marginal tax bracket of those investors who switch from tax-exempt to taxable securities.

The overall objective of this legislation, as stated in the Senate Report No. 92-836, is to improve the municipal bond market in four ways:

- to expand the market for municipal bonds in order to attract funds required by state and local governments in years ahead,
- to reduce the amount of cyclical instability in the market occasioned by periodic credit shortages,
- to increase the cost-effectiveness of the Federal subsidy, and
- to provide a comprehensive alternative to the proliferation of Federal credit programs without increasing Federal control over local decision-making.[1]

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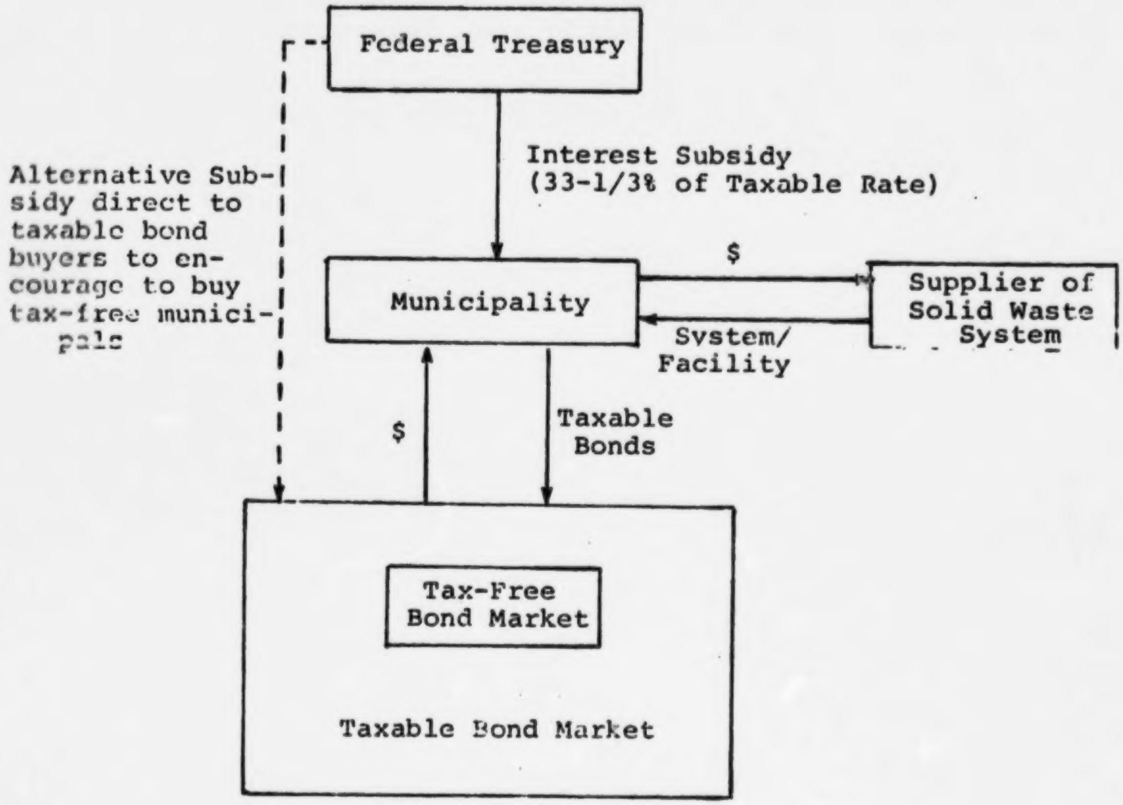
[1] U.S. Congress. Senate. Municipal Capital Market Expansion Act. S.3215, 92d Cong., 2d sess., June 6, 1972. [Washington, U.S. Government Printing Office.] p.2.

Although this bill provides for a federal interest subsidy in the form of direct cash payments, its main effect is the removal of the tax-exempt subsidy to bond buyers. At any rate, from a review of the bill it appears that:

- The interest subsidy provision is intended to restore the cost of municipal capital at the level of tax-exempt bonds; thus municipalities would be in no better or worse a position than they are now. Municipalities are given no new incentives to make investments.
- The subsidy is non-categorical, hence it will not benefit solid waste directly.

Municipal Capital Market Expansion Act


Federal Treasury
Interest Subsidy (33-1/3% of Taxable Rate)
Alternative Subsidy direct to taxable bond buyers to encourage to buy tax-free municipals
Municipality
$
Supplier of Solid Waste System
System/ Facility
$
Taxable Bonds
Tax-Free Bond Market
Taxable Bond Market

Government National Mortgage Association (GNMA)

The Government National Mortgage Association (GNMA) is a wholly-owned government corporation within the Department of Housing and Urban Development (HUD). It was formed in early 1970, to attract additional capital to the home mortgage market. GNMA enables private securities dealers to purchase individual home mortgages and to package these mortgages into guaranteed securities, attractive for resale to individual investors. The law enables GNMA to place the full faith and credit of the federal government behind the principal and interest of the mortgaged-backed securities.

The mortgages themselves are already insured or guaranteed becasue each "pool" consists only of FHA or VA mortgages. Mortgages must be insured or guaranteed to qualify for the program.

This program was established to broaden the housing mortgage market by attracting investors who wished to invest directly in mortgages, but had no other convenient means of doing so. Private dealers provide the refinancing mechanism in this program, with support from the GNMA guarantee. The "mortgage-backed" securities issued by private dealers are known as "pass-through" securities, enabling investors to receive a direct pro-rate share of all monthly principal and interest payments made to the "mortgage pool." A "pool" must have a minimum value of $2,000,000 to qualify for GNMA backing.

Since early 1970, when the program began, more than $4.3 billion of pass-throughs have been floated. As recently as June 1972, they were carrying the highest return of any actively traded, full-faith government obligation, with a yield of 7.15 percent.[1]

The GNMA concept is primarily one of broadening the mortgage market to enable the participation of the individual investor. The value of this concept to solid waste is limited because a well-organized market for municipal bonds already exists, that includes individual investors.

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[1] Breckenfeld, G. Nobody pours it like Fannie Mae. Fortune Magazine, 85(6):86-89,136,140,145-147, June 1972.

Hill Burton Loans and Loan Guarantees

In 1970, HEW began a direct loan and mortgage loan program to augment assistance provided to states under the Hill-Burton Grant program. The loans have the same purpose as the grants; namely, to provide health care facilities to regions needing construction and modernization of facilities. State and local governments, hospital districts, and authorities are eligible for direct loans; private non-profit organizations are eligible for mortgage loan guarantees.

The holders of federally-guaranteed mortgage loans are paid direct cash subsidies sufficient to lower the interest rate by 3 percent. Direct loan borrowers will automatically receive the lower rate, calculated at 3 percent less than the market rate. In fiscal year 1972, $170,000,000 was obligated under this program and an estimated $605,000,000 will be obligated in fiscal year 1973.

Commitments are made prior to construction and the loan terms are not to exceed twenty-five years.

To date, this program seems to have the same weaknesses as the Hill-Burton Grant program. A review of the program reveals that:

- Project planning is inadequate, with little attention given to needs analysis.
- Cost estimates are deficient.
- Below-market interest rate loans give applicants little incentive to examine alternative sources of financing.

Evaluation

Direct Investment Encouraged

Interest subsidies and loan guarantees will stimulate investment as long as the capital is at an effective interest rate that is less than that of the municipality's general debt. The level of investment stimulated will be a direct function of (1) the level of interest subsidy and (2) the markets' perception of the project risk.

A loan guarantee, on the other hand, is limited somewhat in its effect, because once the guarantee is made, the interest subsidy is established. For communities with "high-grade" bond ratings, the guarantee will not represent much of a subsidy, perhaps less than 25 basis points.

Since an interest subsidy can be set at whatever level is necessary to stimulate investment, it can clearly be far more effective than a loan guarantee.

For example, a loan guarantee providing full faith and credit backing for solid waste investments would be more effective in reducing the interest rate for Ba municipalities than Aa communities. If one assumes that Ba municipalities are more likely to be rural areas with small populations, the investment stimulus is for these municipalities rather than larger, more credit worthy communities. The benefits then tend to accrue to communities that do not have the most severe solid waste problems.

On the other hand, an interest subsidy program that provides a percentage interest reduction, like the Municipal Capital Market Expansion Act, will distribute the benefits more evenly.

An interest subsidy tends to stimulate capital intensive solutions. For example, an interest subsidy may push communities attempting to choose between an incineration and a landfill toward the more capital intensive investment. Of course, it is generally true that any capital subsidy encourages greater capital investment, hence more capital intensive projects.

To be effective in the field of solid waste, an interest subsidy or a loan guarantee must be available solely for solid waste projects. The Municipal Capital Market Expansion Act, as proposed, will do very little for solid waste. It affects solid waste investments only in that it affects municipal investment in general. In general, an interest subsidy would be far less effective as an investment stimulant than a grant program. An interest subsidy that provides a greater interest rate savings than a credit bank will offer a greater stimulus to investment than a credit bank.

Type of System Encouraged

Interest subsidies and loan guarantees can be expected to generate investment in capital intensive systems, as do any capital subsidies. Unlike a grant program, which could be designed to encourage any community to invest in capital intensive solutions, an interest subsidy would only influence investment decisions in those communities which are already on the verge of installing capital intensive facilities.

This type of subsidy would do little to promote investment in new technology systems. An interest subsidy would have to be designated specifically for new technology investments to make any difference. Otherwise, it is neutral on new versus existing technology. Given the operating risks of new technology in solid waste, an interest subsidy would do nothing to overcome municipalities' hesitance to support innovation. It is doubtful that this type of subsidy could significantly reduce the overall risk associated with a new technology project.

If an interest subsidy or loan guarantee could be applied to any solid waste bond issue, then there would be a slight tendency for municipalities to build systems somewhat larger than necessary. This might happen simply because of the reduction in cost of capital to the community. Any subsidy which makes it easier for individual communities to raise capital will reduce the incentive toward a regional approach. This will create inefficiencies in some areas. This could be avoided if intensive project review procedures were established, as for Hill-Burton subsidy awards. But this would increase administrative costs. Judging from programs such as Hill-Burton, the review process does not necessarily increase management efficiency.

Finally, to the extent that this type of subsidy reduces the cost of capital for a municipality but not a private company, it obviously discriminates against the latter. As it stands, however, many municipalities are inclined to perform their own solid waste services simply because of the differences that already exist in cost of capital between the two.

Planning and Management

One of the arguments made against the use of loan guarantees and interest subsidies is that, without costly project review procedures, there is no incentive for applicants to improve the quality of project evaluations. Because the subsidy is so readily attainable, as in Hill-Burton, the investment is made in more capital intensive projects, which often turn out to be oversized, or which have proportionately higher operating costs. If this occurs, the manager discovers that without operating subsidies, he cannot afford to maintain the system after it is built.

From the Harrisburg and Braintree cases, it can be observed that municipal decision-makers may invest in technically risky, oversized systems even without subsidies. These experiences underline the thought that subsidies can provide incentives for a risk taking investment at a time when a cautious approach to new technology is needed.

Although an interest subsidy does not stimulate analysis during the planning process, it could be expected to provide incentives for better project management than would a grants program. This is true because the municipality is still liable for all of the bond principal payments, and perhaps some portion of the interest. A grant reduces this liability, and thus removes some of the incentive for good management.

Administrative Complexity

The administrative complexity of a subsidy program depends largely on the machinery of the review process. If there is extensive project review before a subsidy is granted, the process involves a bureaucracy, hence increased complexity and an annual cost that generally is in the millions.

A subsidy program does not need such complex review procedures if it is a flat rate, or is based on a formula, and is available to all municipalities or to all capital projects (e.g., the S.3215 bill). Here, administrative simplicity reduces administrative cost, but, at the same time, foresakes project review and control over ongoing operations.

Since solid waste has traditionally been handled by local governments, or their contractors, project control by a state or federal agency is out of the question, unless hundreds of new solid waste specialists are added to the subsidizing agency's staff.

Equity

As mentioned earlier, a loan guarantee program would discriminate in favor of smaller, rural communities. These communities frequently have lower bond ratings than larger cities, or, no rating at all. Thus, full faith and credit backing from the government would have a significant impact on the risk premiums associated with their bonds. In contrast, the incremental risk reduction on bonds issued by the larger municipalities would be slight.

A direct interest subsidy for solid waste projects may be either neutral or discriminatory. For example, if the subsidy were designed to reduce the net interest rate to a fixed percentage, (e.g., a rate equivalent to a Baa rated bond), communities with higher ratings would be subsidizing those with ratings lower than Baa. If on the other hand, all communities were to receive a fixed-percent interest reduction on any solid waste bond issue, regardless of their effective interest rating, the subsidy would be essentially neutral.

Even in the latter situation, however, any community which did not issue a solid waste bond would, in effect, be subsidizing those that did. Thus, one could argue that most communities would be inclined to issue bonds, rather than depend on pay-as-you-go financing, to take advantage of the subsidy.

CASE STUDIES

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EXPLANATION

The following thirty-eight case studies were prepared as source data for the report. The cases are sequenced alphabetically within three categories, cities, counties and regional systems, and states, and each is organized as follows:

- introduction and key features
- solid waste system background
- recent developments
- financing
- observations

To the extent possible, the write-ups follow a parallel development, with primary focus on the description of the capital formation process. The majority of the cases cover specific cities or communities. However, in several areas where there was a high degree of similarity between community solid waste practices, "state" cases were prepared.

On the immediately following pages are five case summary tables. The first is a general summary of pertinent facts about each case. The remaining four list the cases according to selected variables.

1. by population
2. by financial mechanism used
3. by organizational form
4. by processing/disposal system type.

CASE SUMMARY INFORMATION - GENERAL

Location	Population Size	Refuse Tonnage Generated Per Day***	Transfer/Processing/ Disposal Equipment	Size (Tons Per Day)	Recent Solid Waste System Investment	Financial Mechanism	System Management Organizational Form
Allegheny County and Pittsburg, Pennsylvania* (Regional)	1,654,263	2,480	Landfill Transfer Station	Unknown	4,000,000	General Obligation Bond/Private Financing	County
Arbuckle Regional Development Authority, Oklahoma	14,500	20-30	Landfill	Unknown	110,000	Farmers Home Administration Loan	Regional Authority
Atlanta, Georgia*	497,421	1,000 (estimate)	Unknown	Unknown	2,000,000	Revenue Bond	City
Baldwin County, Alabama	59,382	76	Landfill	40-50	27,000	Current Revenue	Private
Braintree, Massachusetts	36,000	90-135	Incinerator	240	2,750,000	General Obligation Bond	Town
Brevard County, Florida*	230,000	600	Shredding and Landfilling	600	6,520,000 250,000	Revenue Bond EPA Grant	County
Brookhaven, New York	235,000	690 (estimate)	Landfill	1,000	Unknown	Bank Loan	New York State Environmental Facilities Corporation (non-profit public corporation)
Broward County, Florida	620,000	1,200 (estimate)	Incinerator Shredder	800 500	2,600,000 500,000	Revenue Bonds Private Capital	County Private
Cheyenne, Wyoming	40,000	180	Open Dump	--	None	--	City
Colorado	2,210,000	5,857	Landfill	--	None	--	--
DeKalb County, Georgia	414,000	1,330	Shredding and Landfilling Transfer Station	2,000 600	921,000 281,000	General Obligation Bond	County
Denver, Colorado	515,000	575	Landfill	Unknown	--	Current Revenue	City
Des Moines, Iowa	282,330	750 (estimate)	Landfill	Unknown	2,000,000	Revenue Bond ($1,500,000)/ Pari Passu Bond ($500,000)	Regional Authority
Great Falls, Montana	60,091	100	Shredding and Landfilling	560	686,000	Bank Loan	City
Harrisburg, Pennsylvania	73,000	140 (estimate)	Incineration	720	12,500,080	Revenue Bond	City/Authority
Hot Springs, Arkansas	35,000	90	Incinerators	100	1,100,000	Revenue Bonds	City
Idaho	713,000	1,400 (estimate)	Landfill	--	None	--	--
Kansas City, Missouri *	507,000	1,600 (estimate)	Landfill	Unknown	8,450,000	General Obligation Bond	Private
Knoxville, Tennessee	174,587	480	Landfill Transfer Station	Unknown 750-800	975,000 425,000	General Obligation Bond	City
Malden, Massachusetts* (Regional System)	58,000 (1,000,000 estimate)	100-150 (2,000 TPD estimate)	Incinerator	1,650	16,000,000	Undetermined	Private
Memphis, Tennessee	624,000	2,000 (estimate)	Landfill	Unknown	Unknown	Current Revenue / General Obligation Bonds	City
Minneapolis, Minnesota	430,000	510	Landfill Transfer Station	Unknown Unknown	925,000	Private Capital	Private
Nashville, Tennessee	448,000	1,200	Incinerator	720	16,500,000	Revenue Bond	Non-Profit Public Corporation

*Potential systems not yet implemented.

**Partially implemented system.

***Calculated on the basis of a six day week.

CASE SUMMARY INFORMATION - GENERAL (CONTINUED)

Location	Population Size	Refuse Tonnage Generated Per Day***	Transfer/Processing/ Disposal Equipment	Size (Tons Per Day)	Recent Solid Waste System Investment	Financial Mechanism	System Management Organizational Form
New Orleans, Louisiana*	593,471	2,000	Resource Recovery System Incinerator and Dump	1,000 (estimate) 1,000 (estimate)	None	Federal Grant or Private Capital	City/Private
New York, New York *	8,000,000	26,000	Incinerator Landfills	7,000 Unknown	70,000,000	General Revenue Bonds	City
Orange County, Florida	344,000	700 (estimate)	Landfill Transfer Stations*	Unknown Unknown	1,700,000	Revenue Bond	County
Portland, Oregon (Regional)	382,019 (800,000)	750 (estimate) (1,600 estimate)	Landfill	Unknown	143,000 ('72-'73)	Current Revenue	City
Sacramento County, California	830,000	1,600 (estimate)	Landfill Transfer Station Transfer Station*	1,000 120 (estimate) 50-75	968,000 -- 968,000	Current Revenue -- 16% U.S. Air Force 84% Current Revenue	County -- County
St. Louis, Missouri	572,000	1,000	Incinerator Utility Boiler	1,000 600	3,370,000 2,300,000	General Obligation Bond Federal Grant/ General Obligation Bond/Private Capital	City Public Utility
San Diego County, California *	1,500,000	2,000	Pyrolysis	200	4,000,000	75% Federal Grant 25% Current Revenue	County
Saugus, Massachusetts* (Regional System)	25,000 (1,000,000 estimate)	50-75 (2000 TPD estimate)	Incinerator	1,200	30,000,000	Private Capital	Private
Seattle, Washington	531,000	1,000	Landfill Transfer Station	Unknown 2,000	820,000 3,700,000	Current Revenue --	City --
S.E.Oakland County, Michigan	360,000	810	Incinerator Transfer Station	600 1,800	1,400,000 1,500,000	Revenue Bonds/ Current Revenue	Authority
Ventura County, California	381,000	1,200	Landfill	Unknown	1,150,000	3% Federal Grant 97% Current Revenue, including Revenue Sharing	County
Vermont*	444,732	1,000 (estimate)	Resource Recovery Landfill	900	Unknown	State Bond Bank/ Current Revenue	State/Towns
Washington*	3,400,000	10,850 (estimate)	Landfill Transfer Stations	Unknown Unknown	— —	State Grants/ Other	--
Weber County, Utah	120,000	250	Incinerator Expansion Incinerator	300 150	487,000 624,000	Current Revenue 58% U.S. Dept. of Defense 42% Current Revenue including Revenue Sharing	County
Wyoming	332,416	664	Open Dump	--	None	--	--

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*Potential systems not yet implemented.
**Partially implemented system.
***Calculated on the basis of a six day week.

CASE SUMMARY BY POPULATION

0-50,000	50,000-100,000	100,000-500,000	500,000-1,000,000	1,000,000-Up
Arbuckle Regional Development Authority, Oklahoma	Baldwin County, Alabama	Atlanta, Georgia	Broward County, Florida	Allegheny County and Pittsburg, Pennsylvania
Braintree, Massachusetts	Great Falls, Montana	Brevard County, Florida	Denver, Colorado	Colorado
Cheyenne, Wyoming	Harrisburg, Pennsylvania	Brookhaven, New York	Idaho	New York, New York
Hot Springs, Arkansas	Malden, Massachusetts (Regional Population - 1,000,000)	DeKalb County, Georgia	Kansas City, Missouri	San Diego County, California
Saugus, Massachusetts (Regional Population - 1,000,000)		Des Moines, Iowa	Memphis, Tennessee	Washington
		Knoxville, Tennessee	New Orleans, Louisiana	
		Minneapolis, Minnesota	Sacramento County, California	
		Nashville, Tennessee	St. Louis, Missouri	
		Orange County, Florida	Seattle, Washington	
		Portland, Oregon (Regional Population - 800,000)		
		S.E. Oakland County, Michigan		
		Ventura County, California		
		Vermont		
		Weber County, Utah		
		Wyoming		

CASE SUMMARY BY FINANCIAL MECHANISM USED

General Obligation Bond	Revenue Bond	Bank Loan	Current Revenues	Private Capital	Other
Allegheny County and Pittsburg, Pennsylvania	Atlanta, Georgia	Brookhaven, New York	Baldwin County, Alabama	Allegheny County and Pittsburg, Pennsylvania	Arbuckle Regional Development Authority, Oklahoma
Braintree, Massachusetts	Brevard County, Florida	Great Falls, Montana	Denver, Colorado	Broward County, Florida	Brevard County, Florida
DeKalb County, Georgia	Broward County, Florida		Memphis, Tennessee	Minneapolis, Minnesota	Des Moines, Iowa
Kansas City, Missouri	Des Moines, Iowa		Portland, Oregon	New Orleans, Louisiana	Malden, Massachusetts
Knoxville, Tennessee	Harrisburg, Pennsylvania		Sacramento County, California	St. Louis, Missouri	New Orleans, Louisiana
Memphis, Tennessee	Hot Springs, Arkansas		San Diego, California	Saugus, Massachusetts	Sacramento County, California
St. Louis, Missouri	Nashville, Tennessee		Seattle, Washington		St. Louis, Missouri
	New York, New York		S.E. Oakland County, Michigan		San Diego County, California
	Orange County, Florida		Ventura County, California		Ventura County, California
	S.E. Oakland County, Michigan		Vermont		Vermont
			Weber County, Utah		Washington
					Weber County, Utah

CASE SUMMARY BY ORGANIZATIONAL FORM

Town/City		County		Authority		Non-Profit Public Corporation		Public Utility		Private	
Location	Financial Mechanism	Location	Financial Mechanism	Location	Financial Mechanism	Location	Financial Mechanism	Location	Financial Mechanism	Location	Financial Mechanism
Atlanta, Georgia	Revenue Bond	Allegheny County & Pittsburg Penn.	General Obligation Bond/Private Financing	Arbuckle Regional Develop. Author., Oklahoma	Farmers Home Administration Loan	Brookhaven, New York	Bank Loan	St. Louis Missouri	Federal Grant/ General Obligation Bond/ Private Capital	Baldwin County, Alabama	Current Revenue
Braintree, Mass.	General Obligation Bond	Brevard County, Florida	Revenue Bond; EPA Grant	Des Moines, Iowa	Revenue Bond/ Pari Passu Bond	Nashville Tennessee	Revenue Bond			Broward County, Florida	Private Capital
Cheyenne, Wyoming	--	Broward County, Florida	Revenue Bonds	Harrisburg, Penn.	Revenue Bond					Kansas City, Missouri	General Obligation Bond
Denver, Colorado	Current Revenue	DeKalb County, Georgia	General Obligation Bond	S.E.Oakland County, Michigan	Revenue Bonds/ Current Revenue					Malden, Mass. (Regional Sys.)	Undetermined
Great Falls, Montana	Bank Loan	Orange County, Florida	Revenue Bond							Minneapolis, Minnesota	Private Capital
Hot Springs, Arkansas	Revenue Bonds	Sacramento County, Cal.	Current Revenue; 16% U.S. Air Force 84% Current Rev.							New Orleans, Louisiana	Private Capital
Knoxville Tennessee	General Obligation Bond	San Diego California	75% Fed. Grant 25% Current Revenue							Saugus, Mass. (Regional Sys.)	Private Capital
Memphis, Tennessee	Current Revenue/ General Obligation Bond	Ventura County, California	3% Federal Grant 97% Current Revenue, incl. Revenue Sharing								
New Orleans, Louisiana	Federal Grant	Weber County, Utah	Current Revenue; 58% U.S. Dept. Defense 42% Current Revenue inc. Revenue Sharing								
New York, New York	General Revenue Bonds										
Portland, Oregon (Regional)	Current Revenue										
St. Louis Missouri	General Obligation Bond										
Seattle, Washington	Current Revenue										
Vermont	State Bond Bank/ Current Revenue										

CASE SUMMARY BY PROCESSING/DISPOSAL SYSTEM TYPE

Landfill	Shredding and Landfill	Incineration	Resource Recovery
Allegheny County and Pittsburgh, Pennsylvania* Arbuckle Regional Development Authority, Oklahoma Baldwin County, Alabama Brookhaven, New York Cheyenne, Wyoming Colorado Denver, Colorado Des Moines, Iowa Idaho Kansas City, Missouri Knoxville, Tennessee* Minneapolis, Minnesota* New York, New York Orange County, Florida* Portland, Oregon Sacremento County, California* Seattle, Washington* Ventura County, California Washington*	Brevard County, Florida DeKalb County, Georgia* Great Falls, Montana Wyoming	Braintree, Massachusetts Broward County, Florida (inc. shredding) Harrisburg, Pennsylvania Hot Springs, Arkansas Malden, Massachusetts Nashville, Tennessee New Orleans, Louisiana New York, New York St. Louis, Missouri Saugus, Massachusetts S.E. Oakland County, Michigan* Weber County, Utah	New Orleans, Louisiana San Diego, California** Vermont (inc. landfill)

*Includes Transfer Station
**Pyrolysis

Atlanta, Georgia

Atlanta, the capital of Georgia and the county seat of Fulton County, is the largest city in the state, with a land area of approximately 132 square miles. The population of the city has increased slowly over the past decade, from 487,455 in 1960 to 497,421 in 1970.

Atlanta has traditionally financed solid waste capital expenditures through the use of revenue bonds. As with many other cases we examined, however, the sanitation department's budget runs an annual deficit which is subsidized out of general tax revenues.

Solid Waste System Background

The city's sanitation department currently provides refuse collection and disposal services to all residential units and to the majority of commercial and industrial establishments within the city. Approximately 1,000 tons of solid waste are disposed of daily.[1]

Most of the operating costs for providing these services are paid for through user-charge revenues. Currently, the annual rate is $12 per residential lot, plus $8.00 per 25 feet of street frontage, with a maximum of $44. Commercial service is provided on a fixed-rate-per-container basis. At current rates, the department incurs about $2 million annual deficit, which the general revenue fund covers. Efforts to increase rates or to change the type of service--e.g., to less expensive curbside pickup--have been politically unsuccessful.

In 1968, the city disposed of all refuse in two large municipal incinerators. When federal and state air pollution standards became more stringent, however, a major capital investment was required to bring both incinerators into compliance. An independent consultant was hired to estimate the cost of the modifications, and in October 1968, Atlanta went out for bids on Sanitary Department Revenue Certificates worth $4 million. Of this amount, $2,433,349 was to be used to upgrade the older Mayson incinerator, built in 1942, and $1,186,000 was to be spent on the Hartsville Incinerator, built in 1965. The remainder would cover engineering inspections, tests, and contingencies.

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[1] This is a rough estimate, based on population and a refuse generation rate of 4 lbs. per person per day. The city was unable to provide actual tonnages.

City officials were somewhat skeptical about the proposed modifications. They decided, therefore, to install air pollution control equipment on only one of the two Mayson furnaces, and to test the results before making further expenditures.

In 1970, capital improvements to the Mayson incinerator were completed and tests were initiated. After one year of trial operation, it was determined that the new system would not be able to meet the particulate emission standards. The city was forced to close the facility.

Since that time, Atlanta has continued to operate the 1,000 ton per day Hartsville facility, without modification, as well as six landfills which handle the 50,000 cubic yards per month of refuse which formerly went to the Mayson facility.

Recent Developments

Currently, Atlanta faces considerable pressure either to upgrade or to stop incinerator operations. If a decision to close the Hartsville incinerator is made, approximately three sites are available within the city limits for new disposal facilities. However, Atlanta's Department of Finance believes that issuance of an additional revenue bond would be too costly given the sanitation department's current deficit operations and has limited the project to a maximum capital expenditure of $2 million ($1.8 million remaining from the 1968 issue, and $200,000 out of subsequent operating budgets).

Five alternatives appear to be under consideration. First, Atlanta can install air pollution control equipment on the Hartsville incinerator. The consultant who conducted the Mayson incinerator study estimates that the minimum costs would be $990,000, and that once incorporated, additional operating costs will amount to $60,000 annually. But, it is probable that the state will require that waste water treatment facilities be added to the incinerator. This will create an additional capital and operating expense.

A second alternative is an offer from the Southern Railway Company to bale, rail haul, and dispose of the city's refuse for $6.97 per ton. The city sees certain disadvantages built into this proposal, namely, the location of the

15

baling station, the automatic escalation clause in the contract fee, and the relatively high cost of the operation.

A third possibility involves a private firm willing to contract for a recycling operation at fees comparable to landfill disposal costs. The company had firm commitments for sale of recovered materials and was willing to dispose of all refuse, provided the city would sign a long-term contract. Since the city charter prohibits long-term arrangements, no such contract was possible.

The fourth and fifth alternatives both include some form of municipally-run landfill--one with pulverization and one without. Despite public pressure against landfill the city finance department believes this the most economical solution. Nevertheless, the public works department, which makes the final selection of disposal technology, currently favors maintaining the existing incinerator.

The final decision on these alternatives is being delayed. The issue is a politically sensitive one, and 1973 is an election year.

Financing

Atlanta is governed by a mayor and a board of aldermen composed of 17 members and works under a strict budget law which limits anticipated appropriations to 99 percent of the previous year's revenues. Since 1937, the city has ended each year with a cash surplus. With the exception of the sanitation, airport, and water and sewer services, all city departmental operations and capital improvements are supported by the general revenue fund and general obligation bond issues.

Nearly all G.O. bond issues require voter authorization in a special-purpose referendum. The exception is a $4 million bond issued each year for general city purposes without voter approval.[1] On December 31, 1967, the city debt limit on general obligation bonds was $176,843,000.[2] At that time, the outstanding general obligation debt was $117,113,617, or 66 percent of the debt limit. In addition, the city had outstanding obligations on revenue bonds in the amount of $72,522,860. Included in this amount was $2,815,290 worth of outstanding Sanitary Department Revenue Certificates issued in 1949 and 1961.

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[1] A 1968 Constitutional amendment makes this exception.

[2] This is 12 percent of the assessed valuation of taxable property. Assessed valuation is 40 percent of the estimated true market value.

Since 1949, Atlanta has financed major capital improvements in its solid waste system by the use of revenue bonds. The original rationale for using this mechanism appears to have been the similarity of solid waste operations to water and sewer services. Specifically, the Georgia Constitution authorizes the city to make special assessments (i.e., user charges) for both services[1] which can be used to cover both operational and capital expenditures. At the time of the first such issue, it was believed that general obligation bond financing should be reserved for those municipal services which are unable to generate direct revenues. The use of revenue bonds for solid waste operations has been continued because of tradition.

In 1968, Atlanta was unable to raise solid waste service charges to a level where total revenues would be equal to expenditures. Based on cash flow projects prepared at that time, the 1968 Sanitary Department Revenue Certificates received AA rating from Standard and Poor's (identical to the city's rating), and were sold at interest rates ranging between 4.3 percent and 4.75 percent. These rates were comparable to municipal general obligation interest rates at that time.

It is interesting to examine the terms of this issue, since it certainly does not appear to be a true revenue bond. For example, the city pledges a "continuing direct allocation from total service-charge receipts [of] the sums required to pay principal and interest on [the certificates'] respective maturity dates." These allocations have first claim against departmental revenues. Furthermore, the city must "revise and adjust such charges to the extent necessary to produce funds sufficient at all times...to provide revenues for the maintenance of the Revenue Fund, which shall be sufficient to discharge the payment of the principal and interest on said Series." Finally, no new certificates are permitted unless the "principal and interest requirements on all outstanding certificates and those proposed to be issued do not in any one year exceed 33-1/3 percent of the total sanitary service charge receipts in the following fiscal year."

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[1] This became effective in 1937.

Thus, since all county residents must pay the service charge, the risk of default to bond holders appears equivalent to that of a general obligation bond issue. Unlike a true revenue bond, debt repayment need not be a function of net revenues. In fact, operating costs have continually increased since 1968 while the user-charge rates have remained constant. As a result, the city now finds itself with an annual operating deficit of around $2 million. Since this amount is appropriated from the general fund, there is no risk of default on bond repayment.

Observations

Atlanta, like most major metropolitan areas, faces the problem of upgrading and expanding disposal services at a time when disposal sites are becoming increasingly more difficult to obtain. The city appears to be limited to a total expenditure of $2,000,000 for this purpose. Since no effort has actually been made to issue additional certificates, however, it must be concluded that this constraint is in terms of internal allocation rather than the capital market.

The final decision on system selection and financing is likely to be some time in coming. The city finance department is responsible for controlling the cost of any change, and currently favors exclusive use of sanitary landfilling with pulverization. On the other hand, the public works department, which decides how money is spent , favors restoring the incinerator. Complicating the decision is a strong public concern about potential pollution problems, and "aesthetic" reservations about either of these two alternatives.

Braintree, Massachusetts

The suburban town of Braintree is located approximately twelve miles south of Boston and has a population of 36,000 people. It occupies an area of 14 square miles. Braintree has a representative town meeting form of government, with administrative control vested in a board of three selectmen. The community is primarily suburban/residential in nature, although there are a limited number of manufacturing facilities.

Braintree efforts to set up a municipal refuse disposal system illustrate the risks of using untried technology, particularly when financing presents no particular problem.

Solid Waste System Background

Before 1966, Braintree disposed of its municipal and commercial waste in a large open dump located in the center of town. In 1966, the town learned that a large portion of this dump would be displaced by a rapid transit station and a 2500-car parking lot. Since there were no other available sanitary landfill sites in the town, the community was faced with an impending crisis, particularly because solid waste tonnage was expected to increase over the years. The only solution was to design another type of disposal system.

A Town Refuse Committee had been established in the early 1960's to cope with Braintree's growing solid waste problem. In 1966 this committee was asked by the selectmen to survey other communities in the South Shore area, to determine whether or not a joint or regional landfill/incineration effort might be undertaken. According to the Town Refuse Committee's report in 1968:

> None of the local municipalities were willing to consider any firm commitments with Braintree. It is becoming very apparent that no town wants to have another town's rubbish hauled through its streets and disposed of within its boundaries.[1]

As a result of its survey, the Refuse Committee decided that Braintree must solve its own problems. They looked to incineration as a possible solution.

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[1] City of Braintree, Massachusetts. Report of the Braintree Refuse Committee. 1968.

In 1966, Braintree paid their engineering consultants a fee of $200,000 to design an incinerator.[1] The engineers formulated a design of waste heat recovery through steam generation. Steam would be sold to a nearby industrial facility. In 1966, this was a rather sophisticated solid waste concept, particularly for a community with Braintree's population. The proposed plant would utilize two continuous-flow, traveling grate and water wall furnaces, each with a 120-ton per day capacity. In consideration of air pollution problems, it would employ electrostatic precipitators. As stated by the project engineer, "At the time of design ... no plants in the United States were using electrostatic precipitators. However, several of the European plants had records of very satisfactory performance ..."[2] The cost for the entire facility was estimated at approximately $2,750,000, with annual operating costs of $169,000. It was also estimated that annual steam revenues would be $160,000.

Despite the existing regional coordination problems, the engineers estimated future regional needs as between 350 and 570 tons per day, and they designed the facility to serve as a regional operation at some future date. To accommodate expansion the engineers provided for the incorporation of a larger furnace equipped to incinerate 400 tons per day.

Financing

The capital cost of $2,750,000 was financed by a general obligation bond issue approved during a special session of the 1968 Town Meeting. The town has an A-1 general obligation bond rating, with approximately $27 million in bonded debt outstanding. The assessed property value is approximately $150 million, and the tax rate decreased from $103 per $1000 assessed valuation in 1970 to $85 per $1000 in 1971.

With the assistance of a bond counsel and the Municipal Service Department of the National Shawmut Bank of Boston, the town solicited proposals for the purchase of the bonds. The bond issue was $3,435,000 - $2,750,000 for the incinerator and the remainder for unrelated projects (a golf course and a sewer system). Since the financing was to be accomplished with general obligation bonds, the financial advisor made no attempt to assess the economic and technical feasibility of the incinerator. The prospectus for the $3,435,000 issue made no attempt to describe any details about the technology, economic feasibility, or risk of the new incinerator system.

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[1] Heaney, F. L. Air pollution controls at Braintree incinerator. Journal of the Air Pollution Control Association, 22(8):617-620, Aug. 1972.

[2] Heaney, Air pollution controls.

Recent Developments

The town of Braintree began burning all refuse on a regular basis on May 10, 1971, when construction of the facility was virtually complete. The project was officially completed and accepted on August 18, 1971. The facility is operated by town employees, on a two-shift basis, five days per week. The boilers operate continuously, using gas fuel on the third shift and on weekends. Staffing requirements are five men per shift, plus a chief engineer, a scale man, and a night operator.

The town now faces three crucial problems: air pollution, high operating costs, and a lack of buyers for the steam. The incinerator does not meet current Massachusetts emission standards, and Breaintree faces pressure from the state to "clean up" the facility. The extent or cost of corrective measures is not know, but town officials believe that expenditures in the $500,000 to $1 million range will be required.+

Figure 1 summarizes operating cost information for the incinerator. At the current disposal rate of 102 tons per day, the average operating cost per ton is about $21.00. Costs other than depreciation and interest are running approximately 72 percent above the cost estimates of the consulting engineer. On a percentage basis, utility costs in particular differ sharply from the original estimates. This is due primarily to the facility's heavy gas utilization at nights and on weekends. The town expects the situation to worsen as the price of natural gas escalates. Maintenance expenses are also running higher than anticipated, and these are expected to remain at a high level.

Current revenues come from industrial user charges, and it is hoped that these will eventually be augmented by steam sales. The firm which had agreed informally to purchase the steam is now unwilling to do so because it considers the cost excessive.

+ The INCINERATOR WAS DESIGNED AND PLACED INTO operation PRIOR TO THE ENACTMENT OF STATE AIR EMMISSIONS STANDARDS

Observations

Today Braintree officials regret their decision to buy the incinerator. High operating costs and air pollution have resulted from the program. Furthermore, the town did not realize that steam production requires near-capacity use of the system. This is not now possible. Although the facility was designed to accommodate regional solid waste disposal needs, there is some doubt that adjacent communities will ever want to become involved.

Despite the fact that the Braintree incinerator was embodying both technological and economic risk, the community experienced no real problem in financing the project through the general obligation bond. It is often the case that investors in these bonds, backed by "the full faith and credit" of the community, are more concerned with the town's credit rating than with the risks of the particular project being financed.

Brookhaven, New York

Brookhaven, one of ten towns in Long Island's Suffolk County, is located about 50 miles east of New York City. Essentially suburban-residential, Brookhaven has a large number of individual family homes and many apartment buildings. The population of Suffolk County in 1970 was 1,125,000.[1] This represents a 67.5 percent increase from 1960. Brookhaven itself had a 1970 population of approximately 235,000, more than twice the 1960 figure. These large increases in population have brought with them a number of problems--inflated land value, suburban sprawl, and unmet solid waste disposal needs.

The Brookhaven case illustrates the efficient and smooth take-over of a municipality's solid waste disposal operation by a state run public benefit corporation. It also provides a model for reaching a feasible solution to the solid waste problem without totally relying on voter approval.

Solid Waste System Background

Before the mid-1960's, the town of Brookhaven disposed of its solid waste in open dumps. In the mid-1960's, the Holtsville dump, long used for open burning, was converted into a sanitary landfill, in conformance with state law. Today, Holtsville is the only site in use.

Between 30 and 40 privately run firms provide collection services in Brookhaven. It is up to residences and commercial and industrial facilities to contract independently for solid waste collection. Many other residents haul their refuse to the landfill site where they pay a dumping fee. Because competing private collectors have overlapping routes, high costs have resulted from this system of individual alternative.

About 5 percent of Brookhaven has been organized into three or four collection districts. Each has contracted with one collection service. The town pays the contractor and the families pay the town. Billings to residents are made on regular tax bills.

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[1] 1970 Census, Bureau of Census, Department of Commerce.

In the mid-1960's, Brookhaven was forced to begin looking for new disposal sites or alternate methods of disposal for solid waste materials. As the population grew and state regulations became more stringent, the sanitary landfill at Holtsville replaced the open dumps. This method was both inexpensive, and was technically feasible.

According to the New York State Sanitary Code no open burning is permitted in sanitary landfills; its working face must be covered daily; leachates must not enter the water table; and plastic membranes must be used for leachate control.

Recent Developments

In planning for change, the town board selected a potential site and submitted it to a referendum, but their proposal met with heavy opposition from neighborhood people. The town board tried on two other occasions to select sites, but again encountered such resistance that it did not hold a referendum. In 1967, a committee of various town and county and representatives of special interest groups began to study the situation and make recommendations. This committee met frequently over a two-year period. Its findings indicated that a sanitary landfill was the least expensive and most feasible disposal alternative. The committee also recommended specific landfill sites.

Again, neighborhood residents vigorously opposed site locations. Officials felt that the issue would be defeated again if sent to referendum. It was then that the town sought help from the Environmental Facilities Corporation, the EFC, which had the resources to plan, finance, construct, and operate solid waste disposal facilities.

At this point it maybe helpful to digress for a moment and briefly explain EFC's background and modes of operation. EFC was set up as an independent public benefit corporation in 1967 by the State of New York, with its own board of directors. Its capital structure is supported by income earned from planning, operating, and construction contracts negotiated with individual municipalities. The corporation has been active mainly in water supply and sewage treatment projects.

ERC enjoys a wide range of powers, both financial and technical: to borrow money; to issue negotiable notes, bonds or other obligations; to invest funds in obligations of the federal government; to deposit money in banks; to acquire municipal bonds and notes, and make loans to municipalities; to sell municipal bonds, notes, or other securities. EFC also has the power of eminent domain.

Along with these capacities, EFC has another unique feature. Once a town and the EFC reach an agreement, and voters register their accord in a referendum, the EFC is free to operate without further voter approval. After a program is underway only action initiated by a group or individual would void the contract.

In this last feature lay the solution to Brookhaven's site location problem. The EFC was formally requested to work for the town in 1969. On January 21, 1970, EFC hired the engineering consulting firm of Pope, Evans and Robbins (PER) to prepare a comprehensive solid waste management program and PER presented its formal report to the EFC in July 1970. On September 11, 1970, EFC produced its own report entitled, "Parks from Solid Waste."

PER and EFC recommended a system of four sanitary landfills. To reach their conclusions, they had considered a variety of dimensions, among others, growth, site locations, transportation costs, land costs, and operating costs. According to PER and EFC, landfill offered the best alternative when compared to other methods of solid waste disposal (low cost, the availability of adequate sites, sufficient capacity at the sites).

Of particular note, the EFC plan also recommended that three of the landfills be developed into parks and recreational facilities.

PER prepared the design for the landfill facilities. Availability of landfill space was predicated on a population base of the 1970 figure of 235,000, with a projected increase to 650,000 by 1995. With approximately 5 pounds of solid waste per day per person, PER estimated that 215,000 tons of solid waste would be generated in 1970, and 610,000 tons in 1995. Over the 25-year period, PER further calculated that some 11.5 million tons of solid waste would be generated.

The unit cost of operation for the sanitary landfill system, in 1970 dollars, was estimated to be $3.05 per ton. Broken down, this figure includes $0.42 for land, $1.12 for operation equipment, facilities, and administration, and $1.51 for park and recreational development.

In Fall, 1970, after the report was submitted, the town of Brookhaven transferred control of its Holtsville site to EFC. The EFC is currently operating Holtsville with twenty-one full-time and eleven part-time workers, on a two-shift operation seven days a week. On weekdays, 1,000 to 1,100 tons of solid waste are received. There is no dumping fee, but private haulers must buy a $100 license each year for each truck.

Financing

In Brookhaven's earlier attempts to find landfill facilities, the town board needed voter approval of capital funds. At the board's discretion, financing might have been requested either specifically for solid waste disposal, or as part of a larger budget for service facilities. In either case, financing would have been through general obligation bonds pledged by the "full faith and credit" of the town.

Instead, EFC undertook Brookhaven's financing, following the signing of a 20-year contract. Through a series of short term bank notes, the EFC borrows against the contract. The "roll-over" of short-term notes is less expensive than bonds. Short-term notes usually cost about 3 percent; bonds cost about 6 to 7 percent.[1] However, this short-term roll-over is a temporary measure, pending a bond issue when costs will be known and plans will be firm.

The contract calls for the town of Brookhaven to pay the EFC a $3.05 per ton fee to cover all capital, operating, and management costs, as well as a $.30 per ton fee to pay for administration, planning, and management. The contract also includes provisions for renegotiation of the payments, should actual costs change.

Observations

Solid waste financing is not a problem for Brookhaven, since the town has transferred full responsibility for raising capital to EFC. EFC procedures are sound, and its ability to borrow seems strong.

The EFC/Brookhaven relationship reduces the political problem of establishing landfill sites for the next 20 years.

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[1] Short-term notes, in general, have lower interest rates than bonds.

The fact that EFC can plan, finance, construct, and operate the landfills without further approval from the voters is crucial to the success of the venture.

The overall costs of disposal and recreational facilities are low in comparison to other alternatives, such as incineration or pyrolysis. To date, the disposal costs are within estimated budget figures and it appears that the long-term capital outlay will also proceed as planned.

Cheyenne, Wyoming

Cheyenne, the capital of Wyoming and the major population center of Laramie County, is a city of 40,000 people set in the midst of vast open spaces.

Cheyenne's citizens seem to prefer a limited government. The community generally resists governmental expenditures and the addition of any new services. The debt structure of the community reflects this conservative attitude: the low debt allowance (about $3 million) makes even modest capital projects difficult to implement. Rather than plan for future needs, the community tends to respond only to crises. Without a crisis, there is little community concern about solid waste collection and disposal.

Solid Waste System Background

The city of Cheyenne has an open dump which is called a landfill. Laramie county has no disposal site. Residents outside the city limits must dispose of their own waste either on their own property or at the city site. The city generates approximately 100 tons of refuse per day; the surrounding county area generates an additional 50 tons per day. Private collection in the city is provided by two operators, each with two dump trucks. Citizens who do not take care of their own solid waste negotiate contracts directly with the private operators for collection and disposal. Many citizens of Cheyenne have "backyard" incinerators and burn their own refuse. Although burning is prohibited by state statute, only a local ordinance would enforce this law, and Cheyenne has shown no interest in passing such an ordinance.

The city makes no expenditures for solid waste, except for highway department maintenance at the open dump. The county has no solid waste expenditures or facilities.

Recent Developments

There is currently a debate over whether Cheyenne needs an expanded program of solid waste management. While the Model Cities Agency and the County Planning Board believe that at least some strategy should be formulated both city and county sanitation services continue to resist change in the status quo.

Recently, litter from uncollected trash and from the open dump has bothered at least some of the townspeople.

The Model Cities Agency and the County Planning Board have applied to the state, to two federal agencies, The Development of Housing and Urban Development (HUD) and the Environmental Protection Agency (EPA) for a grant to plan a solid waste program. Although the Cheyenne city council and the city's sanitation department may believe that some action is necessary, they do not have any faith in "paper studies." The planning grant application has received little support from the city. The community has actively resisted every new service and all bond issues for the last five years.

Financing

Cheyenne's debt profile reflects the prevailing government philosophy. Cheyenne's debt ceiling is $3,000,000 and rarely has the town had general debt in excess of $1,000,000. Outstanding debt is presently $783,000.[1]

The city believes its solid waste obligations begin and end with making space available for an open dump. There is at this time no capital financing being used for services.

Observations

The state of Wyoming and the city of Cheyenne do not give solid waste service a high priority. No significant money is allocated for solid waste services within the state or city.

Public education in solid waste is being promoted by a few local organizations which foresee major problems arising within the next decade. A number of residents in Cheyenne, and particularly the county planners and the Model Cities staff, believe the growth of the mining industry in the state will double the state's population in the next ten years and that this population expansion may create environmental problems previously unknown in the state. However, these issues are ignored by the majority of citizens in the city and in the state.

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[1] Moody's Municipal & Government Manual, 1972, p.3132.

Denver, Colorado

Denver, the capital of Colorado, is also a county. It encompasses an area of 100,000 square miles and has a population of 515,000.

The case of Denver illustrates a forward-looking regional approach to solid waste management despite the fact that no pressing environmental problems exist at this time.

Solid Waste System Background

Denver's five County Commissioners are responsible for the planning and maintenance of county roads, county hospitals, county recreation facilities and solid waste disposal sites. The level of services is commensurate with anticipated income. The Solid Waste Disposal Act of 1967 gave them responsibility for designation of solid waste disposal sites and facilities.

Denver's Public Works Department provides a municipal collection service for about 129,000 households--single and multiple dwellings and apartment buildings with up to seven units. Municipal disposal takes place in public and private landfills in and around Denver. Private haulers collect refuse from commercial and industrial buildings, as well as apartment buildings with eight or more units. They use the same landfill sites as the city.

Normal residential pickup services are performed five days a week. The city uses about 90 compactor collection vehicles, most of which have a capacity of 20-cubic-yards. Crews work on assigned routes and the normal work day is eight hours. Each crew consists of a driver and two helpers.

Denver pays both the operating and capital costs for its municipal solid waste collection and disposal activities, using monies derived from general funds. Hourly operating costs are approximately $3.25 to $3.75 for the equipment and about $11.00 to $11.50 for the three-man crew.

Collection costs in the 1972 budget amounted to about $3.5 million; disposal costs, about $542,000. Disposal costs included the operation of two city-owned landfills, and the fees paid to two privately-owned sites. Denver budgets $22.00 to $23.00 per ton to collect its annual solid waste pile of 180,000 to 185,000 tons.

City officials are optimistic about Denver's future solid waste management. Operations are well-financed and landfill life is long. One site has a life expectancy of more than 35 years.

Recent Developments

Two major developments have affected solid waste management in Denver: the establishment of the Denver Regional Council of Governments (DRCOG), and the Colorado Service Authority Act of 1972.

The DRCOG is a voluntary association of elected officials from local governments and political subdivisions in Denver and the aurrounding area. It includes five counties and twenty-three cities. The population included within the DRCOG was 1.2 million in 1970. This is expected to grow to 1.5 million by 1980.

DRCOG is a regional planning agency whose responsibilities include collecting, coordinating and disseminating planning information; guiding regional planning efforts; and assisting local jurisdictions in obtaining federal and state aid for urban problems. In 1968, DRCOG set up a Solid Waste Management Advisory Committee (SWMAC).

Through SWMAC, DRCOG sponsored a comprehensive solid waste management analysis and report for the region, called Project REUSE (Renewing the Environment Through Urban Systems Engineering). Also participating in Project REUSE was the Urban Drainage and Flood Control District (UD & FCD). Project REUSE took place between August, 1970 and August, 1972. DROG contributed $40,000 and UD & FCD, $60,000. In addition, the Urban Systems Engineering Demonstration Programs of the U.S. Department of Housing and Urban Development provided a grant of $200,000.

In its report, Project REUSE examined two major urban systems--solid waste, and storm drainage and flood control. For each system a 20-year plan and an implementation program were prepared. To support the program and related recommendations, the proposal also includes a regional overview; the urban system concept; description of existing solid waste management responsibilities, criteria, assumptions and problems; six technical and five management alternatives; and an evaluation of the concepts upon which the program is based. The program covers short-range activities for 1971-1975, and a long-range program to achieve maximum recycling and/or energy and resource recovery.

Project REUSE's objectives fall into two basic categories--minimum environmental pollution and a phasing-out of landfills by 1990. More specific goals include the following:

- The conversion of solid waste management into a contributor, rather than a cost, to the economy;
- The enhancement and conservation of environmental and ecological values through beneficial use of solid waste and by elimination of its pollutant effects;
- The ultimate disposal of less than 25 percent, by weight or volume, of collected solid waste materials in landfill sites;
- The beneficial use of 75 percent, by weight or volume, of collected solid waste materials, through reuse, recycling, or energy recovery;
- The meeting of current air and water quality and other solid waste related standards of local, state and federal agencies;
- The offsetting of solid waste management costs by revenues from sale of materials for reuse or recycling, or from sale of heat or energy derived from processing.

The project's "Final Reports" for solid waste are supported by several other "Supplemental Publications".

The Colorado Service Authority Act (SAA) of 1972 was signed into law by the governor on May 22, 1972. It authorizes the establishment of authorities to provide specific services on a regional basis. Potential service authorities include: solid waste collection and disposal; water collection, treatment and distribution; urban drainage and flood control; public surface transportation; housing fire protection; hospitals; and cultural facilities. An SAA Authority can recommend that it provide any or all of these services. The voters will choose one or more.

Formation of a service authority may be initiated by: (1) a petition signed by qualified electors within the area to be served, numbering not less than five percent of the total votes cast for all candidates for the office of Governor in the preceding election; or (2) a resolution adopted by the majority of the governing bodies of the area's municipalities and counties.

Financing

Denver uses general funds to pay the capital and operating costs for solid waste collection and disposal. No significant expansion in operations or in capital expenditures is currently planned. In 1970 the city set up a reserve fund for depreciation of equipment used for public works, and by 1972 this account held $6.3 million.

Once the Service Authorities are in operation their Boards of Directors will be regional, and authorized to draw from a variety of fiscal resources--*ad valorem* taxes, service charges and fees, inter-governmental grants, shares in state-collected taxes that may be established in the future. Provision is made for the establishment of special taxing districts, so that assessments and fees will be charged only to those citizens covered by the authority's services.

The board is also authorized to issue revenue and general obligation bonds for the acquisition, construction, installation and completion of improvements or facilities. Any indebtedness of this type will require approval from the voters.

Observations

Together, Project REUSE and the Service Authority Act of 1972 provide the city and the region with a solid base for a comprehensive regional solid waste management operation. Even if a regional solid waste authority is not established, Denver should have no problem in maintaining an effective collection system and relatively low cost disposal to private and/or public sanitary landfills.

Des Moines, Iowa

Des Moines, the capital and largest city of Iowa, has a metropolitan area population of 286,000.

This case illustrates the problems, advantages and financing mechanisms involved in the transference of solid waste operations from city government to an autonomous regional agency.

Solid Waste System Background

Before 1969 Des Moines provided residential collection and disposal services. The city operated its own trucks and dumps. Commercial and industrial collection and disposal were handled by private firms. Since land had been plentiful, sites for solid waste disposal were easily obtainable. State laws on sanitary controls were seldom enforced. In 1967, two counties and most of the cities and towns in the Des Moines Metropolitan Area realized that the management of solid waste within their political jurisdictions was becoming a major problem.

Officials in the area were awarded a federal planning grant of $100,000 to assist in the financing of a comprehensive engineering study of the problems, to explore potential solutions and develop a common plan of attack, if feasible.

In 1968, after a year of study, the firm of Henningson, Durham and Richardson, Inc., consulting engineers, issued a report entitled Collection and Disposal of Solid Waste for the Des Moines Metropolitan Area.

The firm found that there were ample technical, legal, financial and political reasons to support a joint approach to the solution of regional solid waste management problems. It recommended the formation of a metropolitan area solid waste agency. The report proposed that an "...agency be operated in a manner similar to a public utility, responsible to the Agency Board rather than any one municipality or county. It should have authority to operate independently of city limits or county lines provided the city or county is an agency member."

It was also proposed that the agency provide two types of service to its members: solid waste disposal alone, and a combination of solid waste collection and disposal. The first was to be financed through a gate fee. It would be open to any person or company wishing to dispose of solid wastes. The second service was to be financed by a user fee contract with the individual agency member.

Recent Developments

On June 1, 1969, the Des Moines Metropolitan Area Solid Waste Agency, called simply, Metro, was established to provide efficient collection and disposal services for Des Moines and neighboring Polk County. At the present time, only the city of Des Moines uses Metro's collection and disposal services. Most of the other communities still depend on private collection services.

The Metro concept is a relatively new one in Iowa. A 1970 Iowa law permits two or more state and local governments to provide joint services and facilities.[1] Metro was created as a public body corporate and politic, and a separate legal entity by a majority of the local governmental jurisdictions comprising the Des Moines Metropolitan Area.

To aid in the establishment of Metro, Des Moines received a demonstration grant of $200,000 from the U.S. Public Health Service. In addition, under a program extended to August 31, 1971, Metro received funds from the Environmental Protection Agency.

Thus, Metro officials anticipated that the agency would be fully funded and operational within two years. It took somewhat longer, however, because Metro had to defend itself before the Supreme Court of Iowa on two separate occasions, before being able to undertake full operations. The first court action was a test of the constitutionality of the basic enabling legislation. The second action concerned the operation of a sanitary landfill facility.

The initial report raised two questions that had to be settled in court: (1) Did the city have the right to delegate authority to an agency created for the express purpose of collection and disposal of solid wastes; and (2) Did Metro have the legal right to issue revenue bonds. The court ruled that Metro did have the authority to acquire land and buildings by negotiation or purchase, as decreed in the aforementioned law on "Joint Exercise of Government Problems."

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[1] Chapter 28E, Code of Iowa, 1966, entitled, "Joint Exercise of Government Problems."

Today, Metro collects solid waste from 60,000 residences in Des Moines. Collections are made by 75 men using 38 trucks on a total of 24 routes. Thirty of the trucks have a 16 cubic yard capacity; eight, a capacity of 25 cubic yards.

Metro discards of its solid waste at its 400-acre landfill thirteen miles from downtown Des Moines. The site was purchased for $240,000 and opened in October, 1971. It has an estimated life of twelve to fifteen years. The landfill operates ten hours for five days of the week, and eight hours each on Saturday and Sunday. It receives between 250 and 325 trucks per day. Another Metro landfill site of 160 acres, located ten miles outside of Des Moines, is being contested in a law suit.

In 1972, Metro handled 240,000 tons at the landfill from city collections, private haulers of commercial and industrial waaste, and residential collections in non-participating towns.

Financing

Since the establishment of Metro, financing has been undertaken on a step-by-step basis rather than through a long-range strategy. Some 108 Des Moines employees and $206,000 in equipment and facilities were transferred from the city to Metro.

The original report preceeding Metro's establishment recommended that basic capital funds for the agency be raised from revenue bonds. Annual operating costs and debt service would be generated from the user-fees charged for collection and disposal. In November 1970, however, Metro was thrust into the collection and disposal operation prematurely, before it could complete its negotiations for the necessary start-up capital. Temporary financial arrangements had to be made. Metro negotiated an open line of credit with the city of Des Moines. On October 19, 1970 under a "Temporary Solid Waste Agreement," the city agreed to pay for truck parking, vehicle maintenance and employee wages until April 1971, when Metro would be in a position to assume responsibility for its own finances. In addition, the city agreed to act as Metro's agent collecting user-fees with its regular billings for water and sewage services. Des Moines pays Metro on a monthly basis.

Metro was set up so that solid waste collection and disposal would be self-maintaining functions. The initial charge to a householder for the collection and disposal of his solid wastes was set at $2.00 per month for once-a-week collection. The dump fee had been set at $.50 per cubic yard. As noted earlier, many other haulers dump at the site and disposal operations produce a "surplus". Metro has, therefore, been able to finance all organizational costs, equipment and facilities expansion.

Since its inception, in fact, Metro has bought $684,000 worth of equipment. About $200,000 of this was in purchase and lease-back arrangements and another $200,000 was provided by bank loans. The balance was the $206,000 paid for city equipment, mainly trucks. Costs included $80,000 each for 2 bulldozers; $82,000 for a compactor, $50,000 for two used scrapers; and $230,000 for fifteen new compactor trucks.

A period of three years was allowed for repayment of capital for the equipment. As of December 31, 1972, Metro had about $140,000 in outstanding long-term debt.

This payment system has proved equitable and feasible for Metro. Recently, the agency paid off the remainder of its debt to the city as a condition of the issuance of revenue bonds for the disposal division.

To guide Metro through the intricacies of marketing the revenue bonds, a financial consultant and a bond counsel were hired. The financial consultant prepared the bond prospectus and conducted the sale of $1.5 million in revenue bonds in November 1972. (However, legal authority for the use of these bonds was not approved until March, 1973.) The bond counsel assisted in the preparation of all legal documents necessary for issuance of the bonds. Metro has also employed an accounting firm to audit its books and to assist in general accounting procedures.

A city resolution authorizes Metro to issue revenue bonds in the aggregate principal amount of $1.5 million, and provides for an additional $500,000 in pari passu bonds. The original bonds ($1.5 million) may be used for equipment, facilities and landfills; the pari passu bonds may only be used for additional landfills. The bonds are denominated in $5,000 units and have maturities of $70,000 to $135,000, in the years 1973 through 1987. They bear interest of between 4.0 and 4.7 percent, the lowest level in the sealed bids at the time of offering.

The uses of proceeds of the revenue bond issue are specified:

Land Cost (Metro Park East)	$240,000
Initial Site Development	700,000
Equipment Fund	225,000
Headquarters and Shop	135,000
Reserve Account	200,000
	$1,500,000

Since the agency cannot tax residents of the areas served, these bonds are only secured by the ability of Metro to collect user fees for solid waste collection and disposal. The resolution setting up the revenue bonds calls for the establishment of a sinking fund with three subordinate accounts: the interest account, the principal account and the reserve account. Metro must make monthly deposits into these accounts to cover the next due payment (semi-annual interest payments and annual payments on the principal).

Observations

Metro has not implemented most of the proposals that were recommended in the original engineering report, but it provides collection for the city of Des Moines only. There are several reasons for the reluctance of member communities to avail themselves of collection services.

The primary reason is that the men transferred from the Des Moines City operation to Metro have a poor work reputation. The Metro labor-management agreement provides for a "parking lot vote" system; this allows truck crews to decide whether or not to work on any given bad-weather day. This provision has been exercised about ten times. The men are required to make up the "weather holiday" on the following Saturday.

Secondly, the private firms have had success in promoting their services over those of Metro. Since Metro absorbed the Des Moines operation, smaller communities apparently feel that Metro is an instrument of the city, rather than of the region.

Metro, as it exists today, has been given no specific standard-setting or enforcement powers, except through its individual municipal entities. Individually, the community or county may enact any ordinances necessary to enforce rules and regulations that are beneficial to the agency or its members. This is hard to do at times. Many factors influence council decisions. For example, it is hard for one community to enact ordinances that might benefit a neighbor. Even environmental issues, such as anti-burning or litter control, are unpopular items on council agendas.

As a result of its recent revenue bond issue, Metro is in a good position to continue its consolidation and growth. Additional financing will be used mainly for equipment, and can be supported by long-term debt, which in turn can be redeemed with proceeds (profits) from operations. The revenue bond issue has provided a sound base for landfill operations for many years and will give Metro sufficient financing to carry out its mandate of solid waste management.

Great Falls, Montana

Great Falls, located in Central Montana, is the largest city in the state with a population of 60,091, and the county seat of Cascade County.

Great Falls provides a unique example of bank loan financing for municipal investment in solid waste disposal equipment. Such an arrangement presents an option for short-term solid waste capital financing at interest rates comparable to those for municipal bonds.

Solid Waste System Background

Traditionally, Great Falls has provided all collection and disposal services to both residential units and commercial establishments. Residents receive weekly curbside pickup service. Commercial refuse is collected daily. The city collects an estimated 100 tons of refuse daily, six days a week.

Until about five years ago, Great Falls disposed of its refuse by open burning. This practice was abandoned following city legislation,[1] and a sanitary "trench method" landfill was established. Because ordinary earth-movers were unfeasible, given the frozen conditions which prevail in the area for much of the year, heavier, more expensive equipment was required for adequate trenching and compacting.

Recent Developments

In the late 1960's, the city began an evaluation and planning study of future disposal alternatives. Despite concern over rising operating costs, as well as rising land values, it appears that attention was focused on continuation of the landfill strategy. Nevertheless, a local Heil equipment representative approached city officials, suggesting that the Madison, Wisconsin shredding project might provide helpful information for solving Great Falls' disposal problems.

When a group of Great Falls officials visited Madison's Heil pulverizing operation, they saw three advantages to adopting this operation:

1. Since the City/County Health Department was willing to exempt pulverized refuse from the daily cover

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[1] State Solid Waste legislation was passed in 1969.

requirement problems of operating in cold weather would be alleviated, and operating costs could then be kept at their present level.

2. Great Falls needed substantial quantities of fill material, and the officials felt that pulverized refuse might be used.

3. Many farmers in the area had expressed interest in using suitable pulverized refuse for compost.

From the time of the city's initial interest in shredding, the Heil Company had maintained close contact with its officials. When Great Falls decided to purchase a shredding installation, the company was in a good position to negotiate. Furthermore, city officials had decided that the Heil pulverizer was best-suited for their needs. They were therefore inclined towards a negotiated bid.

Great Falls' officials wished to avoid a competitive bid because they felt that the legal requirements of a competitive bid would cost them money. The Heil Company had already analyzed the city's needs and had made a proposal to supply a 35-ton-per-hour pulverizer under a turnkey contract arrangement. To ask for competitive bids, the city would have been required to perform the same analysis at its own expense.

The Heil Company submitted a bid for $695,000 for all equipment--two pulverizers (one 30-ton-per-hour unit and one 15-ton-per-hour unit), a building, conveyors, and one 60-cubic-yard transfer trailer and tractor set.[1] Under the terms of the contract, Heil would construct the facility and operate it for 30 days.

Before this bid could be accepted, external events caused a delay in the project. Great Falls had a city election. Some of the new city officials were concerned about the privacy in which the contract was being negotiated. Pressure was exerted. The city engineering department, which had been responsible for the negotiations, was required to go out for competitive bids. To qualify legally as a bidder under these new terms, Heil had to obtain a contractor's license. It also had to pay a state tax of one percent of the gross bid price if it won the contract. The city now had to perform its own needs analysis, for which they obtained the services of a consultant--adding another $35,000 to costs.

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[1] Original specs called for a 75 cu. yard transfer trailer. However, Montana highway load-bearing limits of 40 pounds per square inch prohibited the use of the larger trailer for transporting the denser refuse.

Following notice of its intention to solicit bids, two companies approached the city--Clean Air, Inc., an incinerator manufacturer, and Eidal International, a shredder maker. Discussions were held with both companies and several city officials went to Edmonton, Alberta with Eidal representatives to inspect an installation.

In June 1972, sealed bids were taken. Clean Air, Inc. chose not to bid. A bid from Eidal was rejected on the grounds that it did not conform with the bid requirements. Consequently, Heil was the only qualifying bidder. Its bid of $686,000 ($9,000 less than the negotiated bid) was accepted on October 1, 1972, and a contract was signed in December, 1972.

Financing

Great Falls had an outstanding general obligation debt of $3,944,000 in June 1970. By law, all municipal debt financing must be done through general obligation bonds, revenue bonds, or by way of lease/purchase agreements which do not exceed five years in duration. The city has an A rating on its general obligation bonds.

At the outset of the project, city officials did not favor bond financing, which would have required a referendum because they felt that voters greeted municipal bonds with indifference unless the issues covered "absolutely necessary" expenses such as schools, roads, sewer and water systems. The only alternative, then, seemed to be lease/purchase financing. Consequently, when Great Falls prepared bid specifications for the project, a requirement for contractor-supplied financing was included.

The city had previously financed a municipal shop complex through a lease/purchase agreement with a consortium of local banks. Heil was able to offer a similar arrangement through the American Bank and Trust Company. The bank was interested in the environmental area and was able to provide complete financing through a five-year loan at 5 percent interest. This was agreed upon in the Summer, 1972, when the contract was signed. Monies will be advanced to Heil at the time the project is accepted by Great Falls. At that time, Great Falls will begin making payments directly to the bank.

Two characteristics of this arrangement are noteworthy. First, although Great Falls considers the financial mechanism to be a lease/purchase, American Bank and Trust regards it as a bank loan. Exactly what constitutes a lease/ purchase in the city's opinion is unclear, since Great Falls will have ownership immediately following the first 30-day period. These differing interpretations highlight the degree to which all financing mechanisms use specific terms, making them almost impossible to categorize.

The second significant feature is the interest rate. Since loan interest payments provide non-taxable income to the bank, one would have expected the interest rate to approximate bond rates; perhaps even less, since the loan is short-term. However, the bank set the rate closer to the prime rate in existence at the time of the contract signing for two basic reasons. In the first place, since the contract did not require that debt repayment commence until after project acceptance, the bank anticipated a minimum delay of six months before the loan would actually be made. During this period, bank interest rates were expected to increase steadily. Second, because there was no secondary market for Great Falls' bonds, the bank felt justified in charging a higher rate.

Revenue for this debt repayment will come from a special tax assessment passed by the city council. As part of the annual tax bill, each household will be charged $12 for a "pulverizer amortization fee."[1] In addition, 20 percent of all commercial fees, which are regulated by the city, will be put into this account. The ability of the city to make this assessment is the only guarantee provided to the bank. Since the amount of the assessment is not permanently fixed, however, the guarantee appears to be equivalent to that provided under municipal bonds. Income from this source should easily cover debt repayments, which will be $180,000 the first years, as well as sinking fund requirements. The city anticipates that as more users subscribe to the system, or as revenue-sharing funds are made available, residential assessments can be reduced to $6 annually.

Observations

The pulverizing plant is scheduled to begin construction in March 1973. It will be capable of processing a maximum of 640 tons of refuse per day if operated on a three-shift basis.

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[1] Voter approval was not required for this assessment.

This is equivalent to the needs of a population of 250,000. Initially the system will be serving only the city of Great Falls (population 60,000) and several small incorporated towns in outlying areas.

Recently, Cascade County established a county-wide solid waste district. Under a 1969 Montana law, the County Commissioners have the power to establish such a district, to require compliance with its solid waste program by all "unincorporated" towns, and to finance whatever capital investment is required by 20-year bonds. These bonds would be repaid out of a solid waste tax assessment placed on each household.[1]

The county has subsequently set up a number of small landfills and is performing collection and disposal services for all areas except Great Falls and a few small incorporated towns. These small towns pay a $1 per month (or $12 per year) fee for disposal to the county, which then transfers this payment to the city of Great Falls.

Great Falls has invested in a disposal system with substantial excess capacity. The city engineer felt that this was not unreasonable, however. Great Falls expects its system to have lower operating costs than many of the county landfill systems, and it anticipates increased usage by surrounding areas. It is interesting to speculate on whether this change will ever take place. Since the counties have just set up their own systems, it is not likely that they will switch over any time soon. In the meantime, the residents of Great Falls have to pay off the cost of the pulverizer over the next five years. The operation has a life expectancy of at least 20 years.

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[1] This assessment will be $21 per year.

Harrisburg, Pennsylvania

Harrisburg, located in Southcentral Pennsylvania, is the County Seat of Dauphin County, and has a population of 73,000. This city provides an example of the use of a revenue bond adjusted to take on the risk attributes of a general obligation bond. Furthermore, the case provides an insight into the difficulties of introducing technical innovation and attempting to coordinate regional service.

Solid Waste System Background

Harrisburg provides separate trash and garbage pickup and disposal services for homes and apartments. Garbage is collected and disposed of by independent contractors who work for the city. Trash and all other refuse is collected by city employees in city-owned vehicles and is disposed of in a landfill operated by the city. The landfill equipment is owned by the city and the land is leased. Separate contracts are negotiated for the collection of commercial refuse, and fees are charged for disposal at the town's landfill.

Harrisburg had been using an inadequate solid waste disposal system. For 35 years, the town had an open dump which bordered on a public park. In 1969, combined community pressure and state legal action brought about the closing of the site. An older batch-type municipal incinerator was inadequate for large-scale refuse disposal because of its age, limited capacity, and air pollution problems. Present landfill on private land is strictly temporary, with limited capacity. More significantly, the Harrisburg area is geologically unsuited to landfill: the limestone base results in pollutants leaching into the water table. The state has not approved any new landfills in the area without expensive site preparation, including plastic liners. All existing landfills are under close scrutiny.

In 1965, Harrisburg faced a disposal problem that required study, strategy and swift action.

Recent Developments

Because landfills were considered an unsuitable option Harrisburg officials limited the alternatives to composting and incineration. In 1966, the City Council authorized funds for the formation of a citizens' committee to conduct an engineering study and devise a plan for the disposal of all garbage and refuse collected within the city limits.

To explore the possibility of a regional project, the city invited all of the neighboring communities in Dauphin County to participate in the study.[1] One Borough accepted the invitation but the other communities in the county either expressed no interest or declined to participate. Consequently, the committee did not pursue a regional approach.

Ten months later, in January 1967, the consulting engineer submitted his report. The study was thorough in its examination of the population, the collection practices, current methods of disposal and the quantity and character of refuse.

The study also examined three potential methods of disposal--landfilling, composting, and incinerating.

Landfilling was quickly dismissed because of the large acreage required and the leaching problems which had caused the current dilemma. No estimates were made of the cost of plastic liners for landfills; hence, landfill was never compared to incineration or composting. Composting was dismissed because of poor technical and economic performance elsewhere in the country.

The report recommended incineration because it considered the process "nuisance-free, sanitary," and also concluded that it "requires less area than other alternatives." Recent improvements in the design of incinerators were cited as evidence that this method was feasible.

The incinerator design was to reflect the latest in improvements. It was to be a continuous charging, stoker-fired, water-cooled incinerator, incorporating heat recovery and electrostatic precipitation for air pollution control.

To provide for peak loading, two 300-ton units were recommended. The cost of the project was estimated at $6,850,000. The incinerator would be designed to generate heat. If the heat could be sold, the engineers estimated that annual sales would amount to $157,000. The annual cost of operating the incinerator was estimated at $690,000, or $8.86 per ton. If the revenue from the sale of the heat was applied against the cost, the net cost annually was estimated at $553,000, or $6.86 per ton.

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[1] Technical aspects of the study were performed by Gannet Fleming Cordry and Carpenter, Inc., of Harrisburg, Pennsylvania.

The Harrisburg City Council decided that the engineer's recommendations satisfied the city's disposal requirements. Plans and specifications for the incinerator were prepared.

Financing

The financing decision was based on Pennsylvania tradition rather than specific financial factors related to the incinerator. The debt capacity of the community is $28,107,186 and the outstanding debt at the time of the financing decision was $4,941,520.[1]

In Pennsylvania, most communities have made frequent use of the public authority as a means of financing waste treatment facilities, parking lots, hospitals and other single-purpose activities.[2] The reason is simple: the authority is merely an organization on paper. Yet under a 1968 Pennsylvania law, an authority enjoys unrestricted borrowing power. Thus a city could use an authority to fund its large capital expenditures for special-purpose activities, thus by-passing the city's debt limit, the need for voter approval, and an increase in the millage rate.

In this case, the authority would lease the incinerator to the city. The city would manage the facility and the debt.

The investment bankers advised the community to issue a revenue bond through the authority to raise the needed capital.

The amount of financing needed was determined by the bids submitted by conductors for the design which the consulting engineer developed. The winning bid of $9,500,000 was accepted in December, 1968. The costs of the engineers, lawyers, underwriters, equipment, land acquisition, working capital, bond discount and bond interest during construction added another $3,000,000 to the cost.

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[1] The borrowing capacity of the city is based on 15 percent of assessed valuation. Accrued valuation is 71.9 percent of total property valuation.

[2] In this case, the investment banking firm was C.C. Collings of Philadelphia.

This cost was 83 percent or $5,650,000 more than the consulting engineer's estimate, but this did not deter Harrisburg officials neither did the technological complexity of the system, which undoubtedly contributed to the high bids, cause concern. The bonds sold rapidly in the market and the ability to raise the capital was never in question.

A significant feature of the revenue bond issue was the leasing arrangement that tied the authority to the city. Accordingly the authority would lease the system to the city while the city would pay the authority from revenue obtained from use of the facilities. Revenues would come from a flat charge per residential unit, plus a charge on industrial refuse based on weight of the refuse upon its arrival at the incinerator.

The agreement stipulates that if the current revenues are insufficient to pay all costs of the annual lease, the city will make up the deficit from its operating budget. Furthermore, the city will adjust charges in order to make revenues equal to the annual lease payments.

The bond circular emphasized that the bond did not pledge the "full faith and credit" of the community. In fact, however, the lease arrangement promises the full faith and credit of Harrisburg. Investment bankers told us that such "authority finance" bonds, with a community-backed lease receive the same treatment on the market as general obligation bonds.

Observations

The city of Harrisburg is developing an incinerator for disposal because its present system is inadequate and because incineration seemed the most feasible of the disposal options considered. However, problems have arisen in the first stages of implementation.

First, the particular incinerator design chosen by the city has not yet been determined a technologically satisfactory approach. It is still unclear whether the incinerator will meet Pennsylvania emission standards, and if it does not, how expensive redesign or maintenance costs will be.

Second, the cost of the venture, $12,500,000, is extremely high for a city of 70,000 people. Most cities with populations under 100,000 spend one-half the amount which Harrisburg allocated for incineration.

Third, the concept of heat recovery for commercial sale is worthy of consideration, but there is as yet no proof that sustained, consistent production of energy is possible. Like the new burning process, heat recovery is an unproven technology. Harrisburg did not guarantee potential customers before construction because it could not develop sales before a successful demonstration of energy production took place. Hence, Harrisburg has no customers, and probably will not have any until it produces a consistent level of energy at a competitive cost.

Fourth, the 720-ton-per-day capacity of the system is considerably greater than the community requires. The consulting engineer used an estimate of 6 pounds per day per person, but the study presented evidence that the waste generation was actually 3.75 pounds per day per person. It is sound to plan for growth in population, but historical evidence indicates that the city's growth will be modest at best. In fact, the city has experienced a declining population since 1950. Furthermore, waste generation of 6 pounds per person per day for incineration planning appears totally unrealistic, given the growing enthusiasm for recycling in Harrisburg.

At any rate, there is sufficient capacity in the incinerator for Harrisburg and several other surrounding communities in the county. Although Harrisburg learned during the study phase that surrounding communities did not want to participate in the proejct, the city approved a greater capacity than it needed because it assumed the other communities would eventually use the facility. Nearby communities are waiting to assess the incinerator's performance and the cost of using the Harrisburg system. At present, these communities have alternatives that are more reasonable in cost than the Harrisburg incinerator.

Finally, it appears that Harrisburg has taken significant risk with the backing of taxpayer money, but without agreement from the taxpayers. Harrisburg is advancing the state-of-the-art in domestic incineration, a significant undertaking for a community of its size. The normal checks on risk-taking were not present in this situation, however. The market accepted the bonds because the buyers felt the lease arrangement precluded risk. The technical design was not challenged because no one undertook an objective and critical review of its feasibility. The plan was, in effect, accepted without any firm proof that it would work.

Hot Springs, Arkansas

Hot Springs, Arkansas is a community of 35,000 people, located in the central part of the state. The area is populated by small communities.

Hot Springs had serious problems with its solid waste collection and disposal, and desired a change. The town could use landfill, resource recovery, incineration, or any combination of these. Since the community had been served by private companies, it had to decide whether to manage the system itself or to continue to contract for the work.

Solid Waste System Background

Hot Springs generates approximately 90 tons of refuse per day. Private companies collected the refuse and disposed of it in privately-owned landfills. The system was operated in a laissez-faire manner, with no regulations on the service companies. Each household and commercial establishment negotiated its own service and charges.

The companies' costs have risen in recent years but they have found it difficult to raise their prices. Individuals and commercial establishments could take their refuse to the town landfill themselves if dissatisfied with increased fees. So instead, the service has been cut back. The mayor and the city council have received numerous complaints about inadequate service and extensive litter. Since the private system was not working, some effort had to be made to correct the situation.

Recent Developments

Hot Springs had to decide whether or not it should own and operate a solid waste system. A recent statute passed by the State Legislature enables communities to issue revenue bonds for solid waste activities and facilities. Thus, Hot Springs had access to capital outside of the voter approval process if it decided to take over the system.

The city decided to examine some of the available options. Four alternatives were considered.

First, Union Carbide offered to supply land for a landfill at no cost. The corporation would then reclaim the land for its own use. This option was an interim solution because the capacity of the site would limit the city to six months of fill.

Second, the city could own and operate eight 12.5 ton-per-day incinerators at a location in the center of the town. The community wanted eight incinerators because they felt that reserve incinerator capacity was essential for continuous health disposal.

Third, there was an available landfill located a considerable distance from town. This option was dismissed because of high transportation costs.

Fourth, a large corporation offered to set up a steam generation plant to burn the refuse, in return for the right to keep 50 percent of the steam. Because Hot Springs has such a low volume of refuse, the city vetoed this option.

While disposal options were being examined, Hot Springs decided to use private haulers. The city would purchase equipment and lease it to the companies. In addition, the city would regulate the fees for service and charge each household monthly on its water and sewer bill. The rate for all households would be $3.00 per month. Commercial rates would be based on the number and weight of containers emptied at each pickup.

The issue of using private hauling companies has not yet been resolved completely, even with the new equipment leased to them by the city. The haulers are willing to be city employees, but the city has not decided whether it wants to manage collection of solid waste.

To solve the disposal problem, Hot Springs decided that its plan to own and operate eight incinerators was the most desirable option, because it gave the city control over disposal.

Financing

Hot Springs' costs for taking over a major portion of the solid waste system were as follows:

Eight incinerators	$ 593,000
Buildings & site preparation	138,000
Trucks	239,000
Land	130,000
Total	$1,100,000

An attorney from nearby Little Rock provided financial and legal advice, gratis, and suggested that the city use the recently available revenue bonds as the method for financing. The mayor and his assistant thought revenue bonds were appropriate because they did not require a referendum. This meant the city could move quickly. The City Council approved the bond.

The bond counsel indicated that the revenues from the incinerator should be 140 percent of operating costs, particularly if more bonds were to be issued. The city does not intend to cover deficits in the operation of the system, but will increase charges to insure that revenues cover costs.

The city has estimated that the disposal costs will be $6.18 per ton; and the collection and hauling costs, $9.70 per ton. The system will operate twelve hours per day, six days a week, or 312 days per year. The charge system for commercial and residential service will generate $640,000 in revenues. This will adequately cover all costs. From the revenues, a reserve fund will be established for the replacement of equipment.

Observations

Hot Springs had no trouble financing its solid waste system once it decided upon its course of action. The $1.1 million issue was a competitive bid, and eleven bidders responded. Investment bankers reviewed cost and revenue projections but the project formula that revenues equal 140 percent of costs appeared to satisfy them.

Hot Springs faced its greatest challenge over siting of the incinerators. The city has limited open space within its corporate boundaries. Since the location of the incinerators was a densely populated area, the residents took the issue to court, though the court upheld the location of the incinerators, but time lost delayed the project.

Kansas City, Missouri

Midwestern Kansas City has a population of 507,000 within the city limits and a population of 1.3 million within the eight-county metropolitan region.

This case presents some of the difficulties surrounding the acquisition of new landfills once capacity of old sites has reached exhaustion. In Kansas City three recent attempts to obtain new sites have met strong neighborhood opposition. City officials, therefore, have had to devise alternative ways to achieve voter approval for solid waste expenditures.

Solid Waste System Background

Kansas City's annual solid waste pile of 297,000 tons is collected in a variety of ways from different segments of the population:

- About 65,000 households "bag" their refuse in plastic containers to facilitate weekly municipal pick-ups;
- Another 65,000 are serviced by private haulers;
- Some 10,000 dwellings have twice-weekly collections arranged by local home-owners' associations;
- The remaining 52,000 homes - mobile homes, public housing, apartments, larger than seven units - each serviced by varying methods of refuse collection.

Kansas City recently closed two of its three landfills and the third is scheduled for closing in July, 1973.

Kansas City operates 38 compactor trucks, ranging in capacity from 18 to 25 cubic yards, each with a three-man crew. On any given day, 27 crews are in the field. The crews work four ten-hour days. During winter, waste volume is 28 percent more than the yearly average, so in peak periods, the crews often work the fifth day at an overtime rate. Fringe benefits and overtime average 30 percent of direct labor costs, while truck operating costs equal $7.30 per hour for depreciation (8-year schedule), insurance, maintenance, fuel, and oil. The city purchased its trucks between 1967 and 1971, and funds for four replacements have been established in the 1973 budget.

Recent Developments

As mentioned earlier, the city was unable to get neighborhood support for landfill sites on three recent occasions. It then turned to a general referendum to get financial support for solid waste spending. Voters approved $8.45 million in waste disposal bonds for unspecified activities in August 1972. This amount was determined by a citizens' committee for capital expenditures. At the present time, the city has not sold any of the bonds.

Thus, even though the city has bonds authorized, it is still unable to obtain public landfill sites. The Public Works Department is studying fifteen potential sites. Officials are not optimistic about their ability to obtain approval for any of these, however. Most believe that the landfills for city disposal will have to be handled by the private sector. Three private operators have offered to set up landfills, with dump charges of about $3.00 per ton.

Private operators are in a good position to purchase new landfill sites, to use sites they already own because they are unlikely to meet a political challenge. The only requirements are both non-political--approval from the zoning board and a City Health Department permit.

A Missouri law requires that all counties have solid waste disposal plans by 1974. In theory, the city may decide in 1974 that it will no longer be responsible for disposal--thereby leaving the issue for the counties to handle. This is, of course, not a practical solution to Kansas City's problems.

Financing

Kansas City has an efficient program for financing both operating and capital expenses for most city services. Funds are raised in two ways: general revenues (taxes, license fees, etc.) and general obligation bonds. In 1972, Kansas City obtained 72 million dollars in revenue. These general revenues are used to support operating expenses and the interest on the general obligation bonds which the city council asks citizens to authorize from time to time.

The property tax produced 67.9 percent of city revenues in 1947. In 1972 it provided only 23 percent. The 15.2 mill levy normally provides 10 mills for operation, approximately 5 mills for debt retirement, and .2 mills for the operation of a museum. In the view of city officials, the 5 mill levy limit seriously curtails the amount of capital improvement (general obligation) bonds the city can issue to meet increasing demands for services. Currently, about $10 million in bonds could be sold without going over the limit.

Kansas City's earnings tax was initiated in 1958, at the rate of 0.5 percent. In December 1970, this was raised to 1 percent, with the provision that municipal collection and disposal would be kept free of all user-charges.

When the city sponsors a "bond election" referendum to get voter authorization to sell general obligation bonds, it links each authorization to a specific capital improvement area, for example, solid waste disposal. But the actual activities to be financed with bond proceeds are stated in general terms only. This gives the city flexibility in meeting specific needs. It also allows the city to sell just that portion of an authorized bond that is necessary for a specific expansion of services.

Observations

. Kansas City's governmental agencies seem well-run. The solid waste collection system is efficient and progressive. Financing is available, and so is the foresight to use funds when necessary. Were it not for neighborhood antagonism to landfills, Kansas City's current disposal problems would be insignificant. Since the city has been authorized to sell $8.45 million in waste disposal bonds and is now well under the limit for such sales, it has the means to expand its solid waste facilities. It had not yet determined how to solve its political problems, however.

A regional planning group, Mid-America Regional Council (MARC), has developed plans for a regional solid waste management agency. They recommend using sanitary landfills exclusively. Through the assistance of this group, Kansas City may find the solution to its solid waste disposal problems.

Knoxville, Tennessee

Knoxville has an expanding population which now stands at 174,587 living within 77.6 square miles.

Knoxville employs a method of financing which is both flexible and easily obtained. All budget expenditures and bond issues require approval of the City Council without direct voter interaction. Capital funds for Knoxville's solid waste system, as well as its other capital projects, are obtained from a capital budget funded by these general obligation issues. The bond circulars are usually not specific with regard to the allocation of funds, and solid waste must compete with other city departments for capital.

Solid Waste System Background

The city of Knoxville currently provides trash and garbage pickup and disposal services for residential, commercial, and industrial generators. A 1971 estimate of refuse volume for the city indicated a flow of 120,000 tons per year, or approximately 480 tons per day on the average.

Prior to July, 1972, the city was disposing of all its refuse at an open dump. A single bulldozer was essentially the only equipment on site. After 1970, Knoxville, like other municipalities in Tennessee, had to comply with a strict state law that outlawed open dumping and required a state permit for any disposal method undertaken. At the time of its original passage, the permit system was to have taken effect on July 1, 1971. Following protests from most municipalities, however, implementation of the law was postponed until July 1, 1972.

This law contained a unique provision: the state would provide a grant to those municipalities able to maintain a satisfactory disposal system. This feature is credited by the state's solid waste office as the major reason for the excellent compliance throughout the state. The legislation provides each municipality with a grant of $.75 per capita[1] for each individual in the jurisdiction being served by the disposal system. This grant was intended to cover approximately one-half of a city's disposal cost.

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[1] The state solid waste office anticipates an increase to $1 per capita in the next session of the general assembly.

Knoxville's initial response to the state law was to establish a committee to study the problem and to choose several potential landfill sites. This committee made very little headway throughout 1971. On January 1, 1972, a new mayor took office. He was confronted with a serious time problem: the open dump had to be phased out in six months. He therefore gave total authority for selection of a landfill site to the director of the Sanitation Department.

Recent Developments

Obviously, in the time available for implementing a disposal system, no options other than landfill could be considered. The problem then became one of site selection. The main questions considered by the director were soil conditions, anticipated public reaction, hauling distance, and traffic patterns.

The city was looking for a site to lease, since it saw no reason to commit funds to temporary land ownership. The site finally located is now being leased for $1500 per month. It covers 56 acres and is expected to last for five years.

During the site selection process, free engineering services were obtained by the city from the Tennessee Valley Authority. A geologist from the University of Tennessee was also hired to assure that state requirements would be satisfied.

The site finally selected was located in Knox County, outside the perimeter of the city. This raised new problems, since approval of the county board would be required. Since the county was also looking for a way to comply with state legislation, Knoxville offered to provide disposal services for the county if site approval was given. The service would be at no direct charge to the county, but the city would receive the county's share of the state's per capita solid waste payment.

Agreement was reached on this proposal, with the added understanding that the city would construct a transfer station to reduce traffic to the landfill site. State approval of the site was also obtained by the July 1 deadline. Thus, both the city and county were able to satisfy the state requirements.

In order to purchase the equipment necessary to operate the landfill and to construct the transfer station, $1.4 million was allocated to the sanitation department for capital expenditures. Of this amount, $425,000 was budgeted for the transfer station. This is to be a three-pit station, capable of processing 750-800 tons per day on a two-shift per day operation. The facility will be constructed by Dempster Brothers on a "turnkey" basis, on a site already owned by the city. The landfill equipment to be purchased is of the usual variety, including a tractor-crawler, a tandem motor grader, a tractor-scraper, and a 24-cubic-yard scraper. Some funds will also be expended for collection equipment.

Financing

At the end of 1972, Knoxville had total bonded debt of $94,589,694. Of this amount, $52,502,780 was self-supporting from revenue generated by specific facility user charge plans. This amount is also in one sense a general obligation of the city's. In addition to its obligated revenues, the city has pledged to fund any deficiencies if net project revenues are insufficient to pay the principal and interest on the revenue bonds. Knoxville also has an overlapping debt obligation with Knox County in the amount of $41,813,133. This represents 66.7 percent of the county's debt.

The total 1972 assessed value within the city proper was $592,976,274, based on 45 percent reduction. Thus, the total direct and overlapping debt, exclusive of self-supporting debt, represents close to 12 percent of the assessed value, or about $400 per capita.

In 1971, Knoxville generated general fund revenues of nearly $25 million. Of the 1971 revenue, $4.1 million was devoted to debt service. This represented about 16 percent of the total general fund budget.

The $1.4 million capital fund for solid waste disposal was obtained from a $9.8 million city general obligation bond issue. As stated earlier, Knoxville issues bonded debt on an irregular basis, generally twice a year. The city aggregates all council-approved capital expenditures and issues the notes when the market conditions seem favorable. In this case, the issue contained $4 million in "Airport Revenue-General Obligation Bonds," and $5.9 million in "Public Improvement Bonds."

Observations

Here is a clear case in which obtaining funds for capital expenditures in a solid waste system presented no problem from the point of view of capital markets. The internal distribution of funds between city departments can create budget problems for solid waste; this does not seem to have occurred in Knoxville. The money requested by the sanitation department was approved and allocated. The problems Knoxville encountered were those that come as a result of poor planning, limited public relations, and political disputes between separate jurisdictions.

Malden, Massachusetts

Malden is a city of approximately 58,000 people, located in the densely populated North Shore[1] area of Metropolitan Boston. The population has not changed significantly during the past 10 years.

As of this writing, Malden has devised no firm alternative to the Saugus dump, which it currently uses. The case is of interest, however, because the alternatives which have been explored involve complex solid waste disposal systems to be designed, built, owned, and operated by private firms. Although sponsored by Malden, the system is intended to serve 500,000 to 1,000,000 people.

Solid Waste Systems Background

Malden and most of the other North Shore communities have used the privately-owned Saugus dump for solid waste disposal for a number of years. Of the approximately $915,000 which Malden spends annually for rubbish and garbage collection and disposal, $570,000 is for private rubbish collection and hauling; $175,000 is for rubbish disposal; and $170,000 is for garbage collection and disposal. The rubbish dumping charge is currently $6-$7 per ton.

Malden generates 100-150 tons of solid waste per day.

The Saugus dump is not a sanitary landfill. Thus it has been attacked by local environmentalists for its ecological impact on the North Shore Marshlands. Both the state and the town of Saugus have put considerable pressure on the owner either to upgrade or close the dump, but they have not succeeded because the Saugus site is presently the only solid waste disposal facility in operation.

A significant obstacle to progress in the search for a viable disposal system has been conflicting interests of the North Shore communities. As described in the Saugus/THESCO case, the North Shore Regional Refuse Disposal Planning Board was established in 1966 to provide an alternative to the North Shore's current disposal site. It appears, however, that not all the communities were equally interested in this effort. When a solution Thermal Energy Systems, Inc., called THESCO, was proposed, it did not satisfy all the communities. One major reason for dissatisfaction was that the owner of the Saugus dump, DeMatteo Construction Company, was to be a partner with Combustion Engineering in the THESCO joint venture. Many communities, including Malden, were not pleased with what they considered DeMatteo's monopoly, and sought alternative solutions. Malden, in particular, had been working on the disposal problem independently and had developed some tentative plans even before the board had begun to function. With the dissolution of THESCO Malden continued its independent efforts.

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[1] For purposes of this case study, the North Shore region is considered to comprise those 15-20 communities, with a total population of approximately 1,000,000 people, which presently use the Saugus, Massachusetts dump for disposal of 1500-2000 tons of solid waste daily.

Recent Developments

In the late 1960's, Malden's Mayor Kelliher, who has served in that office for 14 years, became interested in the high temperature incineration system offered by American Thermogen, Inc. (ATI). This system --the MELT-ZIT Destructor-- was particularly attractive because of the possibility of obtaining a federal demonstration grant to cover part of the cost. In addition, with this system, no preliminary separation would be required before incineration,thus the city's pre-disposal costs would be minimized.

ATI, a subsidiary of Process Plants, Inc., is a small firm that specializes in cryogenic systems. Currently, ATI is attempting to become a major concern in the growing solid waste disposal market with a high-temperature incineration process, the MELT-ZIT Destructor.

Developed in the early 1960's, MELT-ZIT was first demonstrated in a 120 ton per day pilot plant in Whitman, Massachusetts, financed entirely by ATI. The high temperature of 3,000 degrees farenheit enables the system to incinerate efficiently almost anything that can be fed into the receiving vault, including engine blocks. Air pollution, an early problem with the Whitman plant, has been effectively controlled, and ATI representatives state that their system can meet any foreseeable emission standards.

The main component of the system is a vertical shaft furnace, fed continuously by a conveyor. The speed of the conveyor is automatically varied according to the weight of material being processed, to assure uniformity of input to the furnace.

The system produces steam and a slag-like material called "Frit," which has found uses as aggregate in asphaltic concrete and as an insulation material. ATI obtained an agreement with the Ashland Oil Company to buy Frit at a price of $1.25 per ton.

The first operational MELT-ZIT installation was completed in late 1972 for the National Security Agency at Fort Meade, Maryland. The facility was built on a turnkey basis, that is, ATI agreed to design, build and operate the facility, under a Corps of Engineers contract.

As conceived by Mayor Kelliher and ATI, the solid waste disposal system for Malden would be a 1650 ton per day facility located in an industrial park. Collection would continue to be provided independently by a private firm. The industrial park location would be particularly convenient, since it would assure a use for the steam generated by the system. Plans were made to require industrial facilities located in the park to use hot water, heating, and air-conditioning facilities run by the steam from the incinerator. For the use of the Malden site, ATI would pay Malden a fee of $1 per ton of refuse, which at system capacity would amount to approximately $50,000 per month.

Malden received tentative assurance from Environmental Protection Agency officials that it would receive an $8 million Federal grant to finance one-half the capital cost of the system. On this basis, Mayor Kelliher convinced a number of the North Shore communities to join Malden, thereby assuring a minimum solid waste input of 600 tons per day. More users would be added at a later date when final plans were made. It was anticipated that net dumping charges, after steam sale, would be about $14 per ton at start-up loads, and $7 per ton at full capacity.

In addition to persuading neighboring communities to cooperate with Malden, Mayor Kelliher had to arrange for several important issues to be cleared through the State Legislature. He also took steps to make certain that ATI would honor its commitments on a long-term basis. (The details of the arrangements with ATI will be discussed in the financing section of this study.)

Three separate items were covered by special legislation passed specifically on Malden's behalf by the Massachusetts Legislature. First, Malden was authorized to exceed its general obligation debt limit by the $8 million necessary to finance the system. Secondly, the city was exempted from public bidding laws. (This meant that the "sole-source" use of the ATI system on a turnkey basis was permitted.) Third, approval was given for communities using the system to sign long-term (31 years maximum) contracts with ATI. Without this legislative assistance, the proposed system would not have been feasible.

Financing

Malden has an Aa general obligation bond rating, with approximately $9 million bonded debt outstanding. The assessed property valuation is approximately $115 million, and the tax rate increased approximately 25 percent from 1969 to 1971, to a rate of $155 per $1,000 assessed valuation.

As stated in the previous section, the Commonwealth of Massachusetts gave Malden special authorization to exceed its general obligation debt limit by $8 million to finance the system. (The Commonwealth would in no way guarantee the bonds.) Thus, the bonds for this regional system would be backed by the "full faith and credit" of the city of Malden. This mechanism was chosen, rather than an industrial revenue bond backed by ATI, to provide the least expensive financing possible and thereby to minimize the dumping charges. It was also recognized that ATI, even with the backing of its parent, would have a very difficult time providing the required security for an industrial revenue bond at a "reasonable" interest rate. Under this plan, the disposal facility would be owned by Malden and leased by ATI, with the lease payments to cover bond principal and interest, plus administrative costs.

Recognizing the risks involved in the proposed system, Malden sought to reduce its vulnerability by requiring a special form of security in tis leasing contract with ATI. The contract required that ATI obtain the backing of a large "corporate guarantor," such that this third party would guarantee the maintenance of lease payments and the disposal of all solid wastes for the duration of the indebtedness period, which was to be 20 years. In effect, this corporation would assume "unlimited liability" for ATI's obligations under the contract. This arrangement would thereby ensure that Malden could repay its obligation.

This is an interesting organizational and financial mechanism, which assumes key characteristics of both general obligation and industrial revenue bonds. Although the "cost" of the financing is equivalent to G.O. bond costs, the security is, in effect, provided by a private corporation. To be sure, Malden is officially liable for the bonds, but the contract provides ironclad assurance that Malden will be able to meet the obligation, through the corporate guarantor, even if the ATI system malfunctions.

The Malden city council approved the $8 million G.O. bond issue, under the terms described above. Despite the steps taken to reduce Malden's liability, a dissident group within the city petitioned for a referendum vote on the matter by the residents. The City Clerk denied their petition on the grounds that it was filed after the legally established deadline, and the issue was taken to the courts. The city was upheld by the Superior Court, but this decision has been appealed and is still awaiting resolution. This dissident group objected on two counts: first, they were against the use of city-backed bonds for a regional and technologically risky system; secondly, they were strongly opposed to an incinerator for environmental reasons.

As a general obligation bond matter was being disputed in the courts, the project received a serious setback--the rejection of its application for an $8 million demonstration grant. This development revised the economics of the situation considerably, and all plans with ATI have been cancelled, at least for the time being. The EPA rejection was based on the high disposal cost per ton, a lack of firm commitments for steam purchase, and failure to provide for resource recovery.

At the time of this writing, ATI was still in the process of searching for a joint venture partner--the large corporate guarantor--and hoping to proceed with the project at a capital cost of $16 million. The firm is considering the use of industrial revenue bonds, which could be obtianed at a "reasonable" rate with the backing of a major corporate joint venture partner. However, plans are quite uncertain at this time.

Despite the current problems, Malden is considering other alternatives, including participation in the now-doubtful THESCO project (see case on Saugus, Mass.). Some tentative negotiations have taken place with another incinerator manufacturer to build and operate a 600 ton per day conventional incinerator for the Malden area, but nothing firm has been announced in this regard.

Observations

From the outset, Mayor Kelliher's position on the solid waste disposal issue has been that the privately built and owned facility is the only feasible solution for the large complex system needed by a municipality. He does not consider it wise for the city to operate such a facility because of the technological complexity and the risks involved. This appears to be the consensus of the North Shore region, and explains the emergence of both THESCO and ATI as contenders for the major regional solid waste disposal contracts. It remains to be seen whether, given the political and financial complexities, a private corporation will be able to build and operate a major disposal system at a financial return which justifies the risks involved.

Memphis, Tennessee

Memphis, the largest city in the state, has a rapidly growing population of 629,000 spread over its 217 square miles.

The city of Memphis provides a clear-cut example of general revenue bond capital financing. Virtually all capital expenditures in the city are financed out of a single capital account--funded from annual tax revenues and through general obligation bonds. Allocation of funds for specific projects is based on overall city priorities.

Solid Waste System Background

The city's solid waste disposal system is operated in conjunction with the sewage disposal plant by the Memphis Office of Environmental Control. Memphis has a residential garbage and trash collection service that is run by one city department. Funding for this service is from general revenues, although a fee of $2.50 per month is charged each household. These fees are not intended to cover the full cost of the solid waste system. One reason for the imposition of a fee is that Tennessee law places a limit on the *ad valorem* tax rate. The garbage fee, then, not only raises revenues, but establishes a precedent for service charges. Should the city's property tax rate approach the state ceiling, the city has other revenue sources that can be increased.

The volume of solid waste currently collected by the city averages 2,000 tons per day. This amount has increased steadily over the years as the city's population has grown.

Before July 1, 1972, Memphis was operating three open dumps for all solid waste disposal. All three were located in the flood plains of major rivers. As such they constituted serious environemtnal hazards.

Recent Developments

In 1970 the State of Tennessee had passed a strict law that outlawed open dumping and that required a city or town to apply for a state permit for its disposal system. A unique feature of the law was its solid waste grant provision: when a disposal system was given a permit, the state would pay the municipality a grant of $.75 per capita for each individual in the jurisdiction being served by the system.[1]

To facilitate the planning of a solid waste disposal system that would qualify for a state permit, the city gave the responsibility for disposal to the Environmental Office. The engineers in this office had only recently been involved in the planning of a sewage treatment plant built by the city, and thus had the experience to undertake the new project.

Since a decision had to be made in six months, the only realistic option was a sanitary landfill. The city considered the possibility of using a private firm to develop the site. Browning Ferris Industries (BFI),[2] a national solid waste management firm, was asked to submit a proposal and presented its plan in a series of informal meetings. The firm's bid of $2.50 per ton was so much higher than the city's estimate of $1.50 per ton that this option was dismissed.

The city had to locate an acceptable landfill site. During the search, over ten sites were studied before one was selected. About 18 miles from the city, the site was a 920 acre, privately-owned gravel pit, no longer in operation. The owner was delighted to let the city use his land. He saw it as an opportunity to have the property restored to a more useful condition. He refused to sell the land, but agreed to a five-year lease for only $1,500 per year. The only other realistic site available at the time was priced at $10,000 per acre, so the city favored the gravel pit location.

Unfortunately, the site was located in an unincorporated area of Shelby County which was outside the jurisdiction of

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[1] For further discussion of this program, see the Knoxville, Tennessee case and the relevant section in the Financial Mechanisms chapter of Volume I.

[2] BFI currently operates a landfill to service its own commercial accounts, and the city uses it on a non-contractual basis for one section of the city. BFI's disposal fee is $.55 per cubic yard; the city charges outsiders only $.45 per cubic yard.

Memphis. This presented some problems. Initially, the county claimed that the city would need a zoning variance in order to operate a landfill on the site. The city argued that as a public body, it did not need a variance. After intense legal discussions, the city prevailed.

Shelby County was not so easily defeated, however. It instigated proceedings against the private owner, claiming that he would need a zoning permit if his land was to be used as a landfill. At this point Memphis decided to compromise and assisted the private owner in filing for a special permit. After several prolonged debates, the County Board of Adjustment voted to grant the permit.

Before final approval could be given, however, site modifications estimated to cost $60,000 were required. These modifications included street improvements near the site; two entrances rather than the one that had been planned; extra guards; and paved roadways on the site.

Even with the permit and county approval secured, antagonism between city and county continued. Because site modifications were not fully completed by the date of scheduled landfill operations, the county refused to issue a permit and instructed an inspector to see that the site remained closed. Operations began without the permit.

Financing

As mentioned earlier, Memphis budgets capital equipment for all city departments from one account. This procedure means that solid waste capital expenditure needs must compete with other city programs.

The capital budget account is funded from two sources. The first is that portion of general revenues that is not needed for operations. The other source of funds is money raised from general obligation bonds. In cities which do not need voter approval for general obligation bond issues, it is not unusual to raise capital several times a year. This is the case in Memphis, where bonds are usually sold twice each year. Of course, the timing of sales is also a function of bond market conditions, as well as the projected level of the city's capital expenditures.

Observations

Memphis is a large city that seems to have found adequate solutions for its solid waste disposal problems. The city's

Department of Environmental Affairs, which handles the solid waste disposal system, appears adequately financed and staffed. The department is currently examining alternatives for the period beyond the current landfill's life, and already has several new landfill sites under consideration. It also plans to consider other disposal methods on a cost competitive basis.

The capital budgeting process in Memphis provides an excellent example of the way that most municipalities actually fund their solid waste systems. A significant fact is that solid waste disposal must compete with other city projects for capital. The allocation process is a function of the municipality's internal priorities. The use of general obligation bonds rarely means that specific cost or technical information is required.

Minneapolis, Minnesota

Minneapolis, located in Hennepin County, is Minnesota's largest city and has a population of 430,000. This represents a decline of over 50,000 since 1960 and of nearly 100,000 since 1950. Together with its "twin," St. Paul, Minneapolis includes a metropolitan area of 1,814,000 people.

Minneapolis illustrates the problems that confront a large city relying entirely on private firms for solid waste disposal. The decision to use private operators for collection and disposal appears to have been motivated primarily by county policy rather than financial considerations.

Solid Waste System Background

Before 1971, Minneapolis provided residential refuse collection services only, funded from general taxes. Disposal of the remainder of solid wastes was the responsibility of the individual householder. Self-service methods included backyard burning in barrels, use of incinerators, and periodic trips to landfills. Many residents used private haulers on either a regular or an as needed basis.

The refuse collected by the city was burned at two city-operated incinerators, with the ash and other residue deposited in a city dump. Residents were also permitted to dump burnable materials at the incinerator sites. Both batch-feed incinerators, they were very old and violated air pollution standards established in 1970. To attain acceptable emission rates, the incinerators require a total rebuilding.

No estimate of the garbage tonnage now collected and incinerated by the city is available. The city's combined collection and disposal figures average 510 tons per day. This refuse comes from the approximately 120,000 dwelling units that receive the municipal service.

Recent Developments

In 1970, Minneapolis had to formulate a strategy for complying with a statewide burning ban legislated by the Minnesota Pollution Control Agency and scheduled to take effect in March, 1971. This ban would effectively force the closing of both municipal incinerators and prohibit individual residents from backyard burning.

On July 31, 1970,Hennepin County adopted a Solid Waste Management Plan. Deciding that "sanitary landfills and transfer stations would be the best method of solid waste disposal for the next ten years," the county began to process and license applications for sanitary landfills and transfer stations, and started closing dumps which violated the program. In addition, Hennepin's program called for a "maximum of private ownership and operation."

In order to gain community backing, the city of Minneapolis formed a citizens' committee, representing various sectors of community life and business. Working together, the city and the citizens' committee designed a municipally run combined-refuse pickup for private residences. The proposal included use of private haulers under contract, and disposal at a sanitary landfill via privately-managed transfer station.

The decision to use private haulers under contract was made in response to objections that small refuse haulers would be put out of business when the city converted to a combined-refuse pickup. In order to deal more easily with the city, fifty private haulers formed a corporation called Minneapolis Refuse, Inc. This created a situation of convenience for Minneapolis in two respects. First, the city did not have to negotiate a large number of contracts with individual collectors. Second, the city did not face the risk of signing a single contract with a possibly poorly-administered organization. Minneapolis Refuse, Inc. negotiated a five-year contract for a guaranteed minimum of 70,000 pick-ups. The original charge was $2.55 per pickup per month, with an additional $0.54 per pickup per month for disposal if the transfer stations were not operative. The contract permitted renegotiation after six months and allowed for annual renegotiations as well. The current rate is $2.67 per pickup per month and $0.72 per disposal, if applicable.

For political reasons, the city desired to retain all employees who were engaged in the collection of garbage. Fortunately, retention of the city crews established an approximate 40-60 percent distribution between city and private collectors. This ratio provides sufficient stops for the private haulers to meet their minimum guarantee of 70,000 pick-ups.

As mentioned above, the city also decided to contract with a private firm to construct and operate the transfer stations, and to provide final disposal. To this end, a competitive bidding framework was established. The initial round of bids were all rejected because of neighborhood complaints about the locations of transfer stations. The job was subsequently readvertised, with specifications permitting the use of the two existing incinerator sites for transfer station construction. The successful bidder would be permitted to modify the existing structures or to construct a new facility on site. Fortunately, the two sites were located in areas that were convenient to both halves of the city. Presumably, too, the replacement of an incinerator with a transfer station was considered an improvement by its immediate neighbors.

The lowest bid of $4.99 per ton was made by a local firm, Phoenix Industries, that had been formed solely to take advantage of this opportunity. The history of this firm is unclear, it seems that one individual convinced several local investors to join him in the venture. This man was to have total management control of the operation. Several months after the system began functioning, the firm was reorganized and a new management was brought on board. From discussions with city employees, it appears that the original operation was quite unsatisfactory. The financial backers, facing a cash flow crisis, decided to relieve the initial manager of his responsibilities and to hire a new one.

After the bid was accepted, construction of the two transfer stations began. In order to satisfy the Minnesota Pollution Control Agency's burning ban, the city was forced to begin the combined refuse pickup on July 1, 1971. At that time, because the original bids had been rejected, the transfer stations were inoperative. Until the sites were finished, the city used several disposal sites in order to minimize hauling distance and to retain flexibility. They did not want to be dependent on one or two landfills. Operation of both transfer stations finally began on October 1, 1971.

The contract between Phoenix Industries and Minneapolis will last for five years, with a five-year option clause. During the first five-year period, the disposal charge per ton is fixed at the bid price, except for a "cost-of-living" escalation clause and an automatic cost-reduction clause which is a function of tonnage throughout. Under the terms of the latter provision, the current cost to Minneapolis for disposal has fallen to $4.65 per ton.

Minneapolis was fortunate in having no legal restrictions placed on contracting for a solid waste system for a five-year period. No private firm could risk the capital expenditures without at least a five-year contract. Under the current city charter, it appears that only those services associated with refuse removal can be negotiated for more than one year.

Financing

General obligation debt in Minneapolis is limited to 10 percent of total full and true valuation, equivalent to $116,350,782 on December 31, 1969. Outstanding general obligations chargeable to the bond limit amounted to $27,940,160 at that time, indicating a bond margin of $90,016,242, safely within legal limitations.

From the city's viewpoint, their financing decision was simply to contract with a private firm which would raise the capital, purchase the equipment, and operate the system. Thus, Phoenix Industries, the city's contractor, was required to raise the necessary capital funds. As mentioned earlier, Phoenix was a new firm, formed specifically to bid for the Minneapolis contract. It was financed primarily by private equity funds. Unfortunately, the current management was unwilling to discuss the company's financial condition with the writer except in the broadest generalities.

The initial capital requirement was $925,000. This included the two transfer stations buildings for $250,000; eight tractor-trailer units for $325,000; and landfill and transfer station equipment for $350,000. A portion of the $925,000 was provided by a local bank, presumably as a short-term note secured by the equipment. The firm was not willing to disclose the exact arrangement. Additionally, the firm posted a $2 million performance bond with the city.

Conversations with the Phoenix management and Minneapolis officials suggest that Phoenix is actually losing money on its operation. This seems to be a result of its unrealistically low bid. (The next bid was 25 percent higher than the Phoenix offer.) Under the provisions of the contract, the price per ton of $4.65 is now even lower than the original bid. In fact, the city's estimate for operating its own disposal two years earlier was $5.24 per ton.

Observations

To date, the Minneapolis decision to rely on a private contractor for solid waste disposal seems to have been quite cost-effective for the city. The main problem concerns the stability of the private contractor, especially since the contract contains no cost-renegotiation clause. Nevertheless, even if the firm should become totally insolvent and cease operations, the city has the right to purchase the transfer stations at "market value" and could lease a landfill site on its own. Furthermore, the neighboring city of St. Paul is now being serviced by a private contractor who has indicated a willingness to move into Minneapolis should the opportunity arise.

Nashville, Tennessee

Nashville, the capital of Tennessee, and surrounding Davidson County, have a consolidated metropolitan government. Over 448,000 people live in this area. In the early 1970's, Nashville began planning for a $16 million municipal refuse incinerator and central heating facility. Because of the large expenditure involved and the peculiar nature of the service to be provided, a special non-profit public corporation was formed to construct and operate the plant.

Solid Waste System Background

All residential refuse generated within Nashville's city limits is collected by city-owned vehicles and disposed of at five disposal sites. Commercial refuse is collected privately by Steiner-Lief, a local salvage firm.

Outside of city limits, refuse collection services are handled by American Sanitary, a subsidiary of Browning-Ferris Industries, and several one-man operations. American Sanitary and Steiner-Lief are currently requesting permission to purchase and operate their own landfill sites outside of Davidson County.

Until 1972, Nashville, had been operating disposal sites that were open dumps rather than sanitary landfills. Several sites were located in flood plain areas and had been experiencing severe leachate problems for some time. In 1972 both the Federal EPA and the State of Tennessee issued injunctions for these sites.

Recent Developments

When Tennessee passed solid waste legislation in 1970, the public gave increased attention to Nashville's disposal practices. Simultaneously, the state began to exert pressure on the city to close most of its landfill sites. As might be expected, Nashville soon found that securing new sites would be extremely difficult, primarily because of local resistance.

At about the time that these problems were accumulating, a project was underway in Nashville to build a centralized heating and air-conditioning facility for office buildings in the downtown area. The plant was to burn conventional fossil fuels. Initial studies indicated that such a facility was both economically and technically feasible.

Given the nature of the services to be provided, both the gas and electric utilities seemed likely candidates for undertaking construction and operation of the plant. It was discovered, however, that the existing city Charter would not permit such an arrangement. Amendments to the Charter required a referendum, and the time required for the lengthy referendum process presented real problems. The economic viability of the project was critically linked to providing immediate service to several large buildings already under construction in the area. For this reason, a concerted effort was launched to develop a satisfactory alternative organizational form.

After much discussion between the city's law director, bond counsel,[1] and the Internal Revenue Service, the best alternative seemed to be a special, nonprofit public corporation with the power to issue tax-exempt revenue bonds. Consequently, on May 14, 1970, the Nashville Thermal Transfer Corporation was formed. In order to qualify for tax exempt status, the corporation had to meet four criteria:

(1) After all debt is retired, the assets of the corporation must revert back to the city;

(2) All corporate directors must be public officials;

(3) The corporation must carry out a public service function; and

(4) All easements for the heating and cooling distribution system must be given to the corporation at no cost.

Since the revenues to cover operational expenses and debt repayment were to come solely from user contracts, the city immediately began to seek customers for the plant. Shortly after identifying several potential users, the mayor became interested in the potential for converting the plant into a waste-heat-recovery refuse incinerator. This interest stemmed primarily from an awareness that similar systems were used in Europe.

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[1] Borge and Pitt, Chicago, Illinois.

The consulting firm that performed the initial studies[1] was asked to prepare new estimates for a heating and cooling plant capable of burning refuse. The initial plant cost of $4.5 million was revised upward to $8.4 million by the engineers. They determined that these additional capital outlays would be approximately equal to the fuel savings over the life of the project. Since the intention was to have the city deliver some 1200 tons of refuse each day at no charge to either party, the elimination of fuel costs, as well as refuse disposal costs, made the concept attractive.

Discussions between the NTTC Board of Directors and local investment bankers indicated the need to satisfy at least three conditions before financing could be arranged. First, NTTC would have to get commitments from a sufficient number of potential customers to insure above break-even operation. Second, all contracts would have to be negotiated with escalation clauses that allowed the plant to raise rates automatically in accordance with its debt repayment needs. And third, an outside consulting firm[2] would have to be hired to give an unbiased evaluation of the economic feasibility of the plant.

At this point in time, there were no signed contracts with potential customers. Consequently, NTTC had to find some large users. Since the State of Tennessee had many large buildings concentrated in the vicinity, it seemed a prospective customer. In June, 1970, the State entered into a 30-year contract with the city that included the following provisions:

(1) Two state officials must be appointed as NTTC board members;

(2) All system extensions, beyond what is needed to supply the State, must be self-amortizing;

(3) The contract was not binding if a break-even load was not reached;

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[1] I. C. Thomasson & Associates, Inc., Nashville, Tennessee.

[2] The engineering consulting firm of Duff and Phelps, Inc., of Chicago, Illinois, was hired to perform an economic feasibility study of the Heating and Cooling System Revenue Bonds, which appears as Appendix A to the offering statement for issuance of revenue bonds by the Nashville Thermal Transfer Corporation, May 12, 1972.

(4) No user contract could be signed that gave more favorable terms than theirs.

Immediately following the signing of the state contract, the metropolitan government entered into a contract for its buildings.

Despite this show of State support, many private concerns were still reluctant to commit themselves to the project. In addition to these problems, NTTC was faced with an immediate need to secure a site for the plant if service delivery schedules were to be met. A GSA-owned plot was located that required a $25,000 deposit. Because NTTC already owed about $300,000 for engineering consulting services, it approached a consortium of local banks for loan money. A $2 million line of credit was granted the corporation, enabling it to purchase the tract of land. More importantly, the support given to NTTC by the financial community apparently convinced the private sector that the project was viable. Soon after, private users began signing up.

Since it now appeared that the project would be implemented, NTTC began to seek construction bids. The low bid for construction of the entire system, including distribution lines, was about $16,500,000, approximately $4 million more than estimated, and concern again mounted over the need for more revenue.

In addition to seeking more contract commitments, the corporation went back to the city, charging that NTTC should not have agreed to accept the city's waste free of charge. An agreement was negotiated by which the city would pay the corporation $.75 per year for each person in the metropolitan area--if the plant complied with pollution regulations. This money was to come from a state grant.[1] This amounted to roughly $336,000 per year in additional revenue to the corporation.

Significantly, the corporation does not guarantee acceptance of a fixed amount of refuse. If it becomes necessary to reduce substantially, or even eliminate, the refuse input in order to maintain sufficient steam output,[2] the city must dispose of its refuse elsewhere.

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[1] The state solid waste legislation passed in 1970 provides that to each municipality whose disposal system is given a permit, the state will pay a grant of $.75 for each individual in the jurisdiction being served by the disposal system.

[2] The system can also be fired by fossil fuels.

On the other hand, the city is obligated under the existing contract to pay the $.75 per capita per-annum fee to the corporation, regardless of the volume of refuse that the plant is willing to accept.[1]

Because of this situation, the Nashville Department of Public Works is currently implementing a sanitary landfill system capable of handling the entire metropolitan waste generation load. Apparently this department was not actively consulted until higher city officials had decided to go ahead with the project--thus the duplication of effort and expense. Although the Director of Public Works is now a member of NTTC's Board, this was not true at the beginning of the project.

With a greater than break-even level of contracts, NTTC needed only to get the State Legislature to exempt it from ad valorem taxes before a sufficient cash flow was assured. Despite some difficulty, this variance was granted.

The only remaining requirement that the state and metropolitan governments insisted on was that NTTC get a tentative permit from the EPA. EPA, however, expressed certain reservations about the plant's capability for complying with air pollution standards to both Nashville and the State of Tennessee. The system's designers were persistent in their efforts to get the project approved and were subsequently able to get a performance guarantee from the suppliers of the wet scrubber system and dry cyclone. With this guarantee, the local Health Department was willing to issue NTTC a tentative permit. Under the structure of the federal permit system, this was sufficient.

Financing

As indicated earlier, revenue bonds were used to finance the total project cost of $16,500,000. A five-member syndicate of regional investment bankers was brought in for a negotiated sale. The bonds received a Moody's Engineering (A) rating and a BBB rating from Standard and Poor's.[2] The sale resulted in an average interest rate of 5.7 percent (July 1972). One of the investment banking representatives estimated that this was probably about 50 basis points higher than the price of a comparable municipal revenue bond.

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[1] This payment will be reduced, however, as more customer contracts are signed. No formula to govern this reduction had been worked out at the time the case was written.

[2] The metropolitan government has an Aa rating on general obligation debt and electric utility revenue bonds. Water and sewer revenue bonds have ratings of Aaa and A.

The bonds were subsequently sold by the syndicate to twelve large institutions, most of them banks and insurance companies. This took only a few days.

Observations

Nashville presents a curious example of public decision-making. As it now appears, the city will be building two disposal systems--both capable of handling the metropolitan area's entire solid waste needs. Despite a lengthy planning process and extensive engineering, the consideration given to disposal alternatives appears to have been minimal. Even when a second team of engineering consultants studied the situation, the analysis seemed to focus solely on the ability of the contract fees to meet already established operating costs and debt-repayment schedules. No outside technical evaluation was solicited.

A second significant aspect of this case was the role played by the investment bankers. From beginning to end, their sole concern was to insure that sufficient revenues could be generated to cover the costs determined by the engineers. At no time did anyone seriously challenge operating cost estimates or the technical feasibility of any aspect of the system. When interviewed, one of the principals responsible for the underwriting was not even aware that EPA had expressed any reservations about the system's performance.

Revenue bond financing through a non-profit public corporation, backed with long-term escalating contracts, is another way in which a municipality can structure a financing arrangement to approximate the risk characteristics of a general obligation bond. As one Nashville legal advisor stated, the different in risk between the two mechanisms was essentially psychological.

New Orleans, Louisiana

New Orleans is located on the Mississippi River and and has a population of 593,471 within the city limits. New Orleans faces several major problems in solid waste disposal. Its high water table precludes establishing landfills, and current sites in operation have come under public attack. Moreover, the city's incinerators are faced with being shut-down for violating state air pollution standards. New Orleans, then, is an example of a city which must act quickly to develop an environmentally-sound and economically feasible strategy for solid waste management.

Solid Waste System Background

The city of New Orleans provides residential collection; commercial and industrial collection is handled by private contractors. The city adds a one-dollar charge to the monthly sewer and water bill for its collection service. This money goes into a general fund, from which the sanitation department is completely funded.

The city provides five incinerators and two landfills for disposal. At present, there is considerable public demand to dismantle the incinerators because of their unsightliness. The city generates 2,000 tons of refuse per day, however, and the 1,800-ton capacity of the incinerators nearly meets that flow. Actual performance of the five incinerators does not match capacity,however, as revealed in Table 1.

Incinerators in New Orleans have a history of high construction and maintenance costs, numerous breakdowns, extensive downtime, and low tonnage. In addition, all the incinerators except East are in violation of state air pollution standards and the state believes that this facility will also be in violation soon. The city, however, feels that the facility can satisfy state air pollution standards for the next several years. As for landfills, New Orleans' high water table has created a major solid waste disposal problem, despite the abundance of open space for possible sites.

Against this background, the mayor of New Orleans recently initiated a study of solid waste disposal alternatives.

Recent Developments

The mayor was prompted to initiate a study because of neighborhood complaints about the Algiers landfill, a rat-infested, open-burning dump. To compound the problem, its two incinerators were sending noxious emissions into the atmosphere.

An alternate landfill site was examined by a consulting engineer. The land was appraised at $12,000 an acre because it had the potential for industrial development. Unfortunately, it was a cypress swamp, covered by three feet of water. It would need extensive preparation before it could be used as a landfill.

The site was finally rejected because the wet areas formed methane gas that caused continuous fires.

The study team, made up of staff from the mayor's office, then dismissed five more disposal alternatives. Their reasons are given below.

> The possibility of incineration was dismissed because of its high cost, high maintenance requirements, and the possibility that it would not meet the state's air pollution standards.
>
> Pyrolysis was rejected because it was a new and unproven process. Furthermore, it required technical skills not available in the city, and the cost was expected to be high.
>
> Compaction was rejected because bales cannot be adequately disposed of in swampy landfills.
>
> Reclamation was also considered infeasible: extensive separation was required, with attendant technical problems. Furthermore, it would be difficult to market many of the reclaimed goods.
>
> Contract waste disposal was rejected because it involved a long rail haul, at a total capital cost of $11,250,000.

The study group discussed three alternatives that seemed feasible. The first, pulverized waste with a landfill, would reduce volume by 35 to 50 percent. The operation would require less personnel than incineration.

The capital costs would be lower than for incineration. The study group did not quantify the difference in costs, however.

The second viable alternative was to upgrade city landfills and to use outside contractors for disposal of 50 percent of the city's waste.

The third acceptable alternative was to upgrade the open-burning Algiers landfill site and to add a transfer station. Some waste would be dumped at Algiers; the rest would be hauled by rail from the transfer station. A private contractor would run the railhaul system, as well as another disposal site.

Just when the study group was about to make a recommendation, it was presented with a new alternative. The National Center for Resource Recovery proposed that New Orleans become the first major metropolitan area to test full-scale resource recovery. According to the proposal, the National Center would process 50 percent of the city's waste; the city would process the remainder. The city would use the New Orleans East incinerator for its disposal, dumping any residue at a landfill.

The National Center cost proposal ranged from $5.50 to $6.50 per ton. This was considerably less than the $11.50 per ton that New Orleans was averaging at the time. The $5.50 estimate was the full cost to the city. The National Center, according to the proposal, would retain all profit made on the sale of the recovered material.

At the time of this writing, the city was actively involved in negotiations with the National Center, but had made no final decision.

Financing

New Orleans has always financed its operating activities from the general fund. The city's major sources of revenue are the property tax and the sales tax.

The city's disbursements in 1971 were $67,700,046. Its solid waste expenditures for that period were $4,037,673. Of this amount, $4,606,137 was for residential services; $203,954, for supplies and materials; and $177,000, for capital expenditures.

The city has a capital fund appropriation which is made up of the revenue remaining after disbursements are made from the general fund, plus public improvement general obligation bonds.

The debt limit is presently $232,000,000, based on 18 percent of the assessed value of taxable property ($1,289,742,490). The city's current general obligation debt is $162,279,000, or 70 percent of capacity.

The present city administration is not anxious to increase debt substantially at this time because bond payments over the next ten years will average $12 million annually. This figure has been criticized widely by New Orleans voters. A portion of the annual payments go for facilities not now in use. In other words, bond payments have continued beyond the life of the facilities they support. One of these facilities is an incinerator.

For all these reasons, the mayor welcomes the possibility of shifting the cost of solid waste recovery or disposal equipment to the private sector. If the National Center could service 50 percent of the city's refuse, the mayor could close down two incinerators and the Algiers landfill. This would result in annual savings of at least $350,000, and perhaps $500,000 in operating costs. It also means future capital costs could be cut by 50 percent.

If the city is forced to solve its disposal problem through its own financing, it will continue to use general obligation bonds. If the National Center is to provide service to New Orleans, the city does not yet know how the resource recovery system will be financed.

Observations

New Orleans' unusual terrain offers the city an opportunity to explore the possibility of new disposal techniques. But each alternative has been deemed too costly, too risky technologically, or too uncertain.

New Orleans had been hoping to find a short-term solution for its disposal problems. Only when the National Center for Resource Recovery made its proposal was New Orleans willing to innovate. It is too early to tell if the city will be willing to surrender control over the disposal of 50 percent of its waste. From its early responses, it would seem that innovation in solid waste might be slow in implementation.

If New Orleans accepts the National Center's proposal, innovative financing techniques may result. For example, the National Center might use a syndicate to finance the recovery system, offering tax shelters to high-tax-bracket investors through investment tax credits and accelerated depreciation.

Table 1

Incinerator Performance in 1971

Incinerator	Capacity (in tons)	Actual Disposal (in tons)	Cost Per Ton
Florida	400	282	$ 5.12
7th Avenue	400	210	7.15
New Orleans East	400	317	7.00
Algiers	200	110	17.21
St. Louis	400	61	23.27

New York, New York

The five boroughs that make up New York City have a total population of approximately 8 million people.

Although population growth has stabilized, New York's solid waste pile has increased 3 to 4 percent annually. This factor plus others--changes in environmental regulations governing solid waste disposal, filling of some landfills to capacity, air pollution problems associated with the city's incinerators--have, in recent years, made solid waste disposal a serious problem requiring massive amounts of financing for both investment and operation.

Solid Waste System Background

New York generates approximately 26,000 tons of residential, commercial, and industrial solid waste each day, as well as, 5,000 to 10,000 tons of demolition and construction debris. The Department of Sanitation collects about 23,000 tons. Private haulers cart away the rest. Once collected these wastes find their way into either the city's incinerators or landfills. The city employs about 15,000 people in the Sanitation Department and employs about 2,000 collection vehicles.[1]

New York owns seven incinerators, one of which is to be closed this year. These incinerators were built between 1950 and 1963, each with a different design. Each has a rated capacity of 1,000 tons per day, but usually processes only 800 to 900 tons. Of the six remaining incinerators, five are located in Brooklyn and Queens and one in Manhattan.

The city has begun an upgrading program to rebuild certain equipment in each incinerator and to provide electrostatic precipitators capable of reducing particulate emissions to acceptable levels. The estimated cost of upgrading each incinerator is $10 million. The entire program of upgrading is scheduled to be completed by 1977.

The five city landfills are of two types: barge-accessible and truck-accessible. The only barge-accessible landfill is the large Fresh Kills site located on Staten Island. It is fed by shuttle barges, which are filled from trucks at eight marine transfer stations (MTS). Manhattan and Brooklyn each have three MTS, while the Bronx and Queens have one each. Each MTS has a maximum capacity of about 1,300 tons per day, but actaully handles about 1,000 tons per day.[1] Two barges are able to carry the 1,000 tons. At present, the throughput at the MTS is limited by the number of trucks that can be handled during the working period. At the landfill the barges are unloaded at two stations (a third is under construction), equipped with cranes which fill trucks to distribute the solid waste throughout the site.

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[1] New York City's Department of Sanitation provides not only collection services but street cleaning, snow removal and disposal facilities, as well.

The Fresh Kills is the world's largest, receiving about 11,000 tons of solid waste each day. This includes about 1,000 to 1,500 tons of incinerator residue. The city anticipates that the site will be filled in 1985, at which time it will be developed into a municipal park.

The remaining truck accessible city landfills are scattered throughout the five boroughs and have different capacities and life-expectancies.

Recent Developments

New York City has studied several alternatives for handling solid waste disposal in the next thirty years, among them, large-scale incinerators, "islands," alternative landfill sites, and marine transfer stations. At present, public opposition is also deterring the establishment of sites for new marine transfer stations. Some of the alternatives have already been discarded; others are currently at different stages of study. The city uses an estimate of 30,000 tons per day as the planning figure for the 1980-1985 period.

In the past three years, New York has spent about $8 million for studies of large scale incinerators by management consultants. The City Council halted the implementation of one plan for a 6,000-ton-per-day incinerator, because it considered the project too costly. The incinerator would have represented a minimum of $200 million in capital costs and would have had a probable operating cost of $18 to $20 per ton. In addition, the Council considered the proposed facility's air emissions unacceptable in the light of present standards.

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[1] Studies have shown that MTS size should be held in the 1,000 to 1,500 ton range for the most economically feasible system.

The New York City engineering firm of Pope, Evans and Robbins (PER) has prepared a preliminary proposal for a 1,500-acre "ocean-fill" island, to handle not only New York City's solid waste, but also solid waste from parts of upper New York State, Connecticut, Long Island, and Northern New Jersey. Its design capcity is 40,000 tons a day for thirty years. (See Figures 1 and 2.) The island would be constructed on the bottom of the harbor, using concrete perimeter walls 50 feet high, in 25 to 30 feet of water. The solid waste would be dumped within the boundaries of the wall to fill the space gradually. The water displaced would be purified and pumped into the Bay. The volume of solid waste would be built up some 250 feet above the walls. Eventually, the island would be covered with soil, landscaped and developed as a recreational and industrial park. According to PER, the project could be successful only if it were managed by a public utility. Preliminary estimates indicate a construction cost of about $150 million over five years.

Landfill alternatives around New York City are limited and possible sites have been targets of opposition. Environmentalists have opposed these plans because of the dangerous ecological impact of landfills on wildlife. Various communities that would be affected should landfills be established in certain areas have also expressed strong opposition.

As an alternative, New York City has discussed the possibility of developing an upstate landfill with the New York State Environmental Facilities Corporation (EFC), an independent public benefit corporation.[1] Shuttle barges up the Hudson River would be used. To date, the plan has remained in the discussion stages.

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[1] EFC was set up as an independent public benefit corporation in 1967. It is authorized to plan, finance, construct, and operate environmental facilities. It has its own board of directors. Its capital structure, originally provided by the state, is supported by the income earned from planning, operating, and construction fees on each of the municipal projects it has contracted for. The corporation has been active mainly in water supply, distribution, and sewage treatment projects, but has authority to operate in solid waste management.

EFC has the power to borrow money and to issue negotiable notes, bonds, or other obligations of the federal government, or to make deposits with banks. It may also acquire municipal bonds and notes and make loans to municipalities. It is also able to sell municipal bonds or notes or other securites.

New York City has attempted to stimulate new technological approaches to its solid waste problems. It requested proposals for a 1,000-ton-per-day plant which would be capable of performing some combination of volume reduction and resource recovery. It received over 100 proposals. It then selected a group of the larger companeis which had prototypes in operation with at least 40 tons per day capacity.

Each firm's proposal was evaluated in terms of performance guarantees, ability to meet all NYC regulations and codes, financial capability, ability to write a fifteen to twenty-year contract, and ability to build with its own capital resources. The city's objective was to have a firm build the plant, put it through a shake-down phase during which all contract requirements would be met, and then sell it to the city. The city would then lease it back to the builder. Finally, the Monsanto Corporation was selected to build their proposed pyrolysis system. Contracts were negotiated, but problems developed concerning a New York City regulation requiring that the work be opened to competitive bid. This has halted the new program, since the city's solid waste administration believes that the only feasible, long-term approach to this unproven technology is through Monsanto's pyrolysis system.

We have said that New York City's solid waste program requires massive investments and large operating budgets. Complicating this is the complex bureaucratic process which requires extensive planning and maneuvering for each stage. (See Figure 3.)

As an example, consider the proposal for new marine transfer stations. The estimated cost of an MTS capable of handling 2,500 tons per day is about $15 million. If shredding is added to this, the cost rises to about $20 million. It will take five to seven years to go through the planning, designing, budgeting, approval, and construction phases. If it is a particularly smooth situation, it might take five years. More frequently, the process takes longer.

Financing

In 1971, New York City spent a total of $7.5 billion. It finances its Sanitation Department expenses out of general funds from various city taxes--real estate, corporation, rental, cigarette taxes, etc. For Fiscal Year 1973, the city budgeted about $176 million for Sanitation Department expenses.

Capital projects are financed out of funds generated by general revenue bonds. The capital budget in 1972 was $25.2 million. This was a rather low figure and included no major facilities. The monies were used for trucks, landfill equipment, rehabilitation of MTS, and some air pollution control devices for an incinerator. (A detailed breakdown of these figures was not available.)

New York City expects to spend between $600 and $700 million for solid waste management capital equipment and facilities by 1985. This is between $50 and $60 million per year.

Observations

Although New York's solid waste disposal problems are vast, the city has more than adequate capability to finance capital and operating costs for current activities and for the expected growth in solid waste volume.

The city does have three main problems, however: 1) the long time lapse between proposed and implementation of a solid waste facility; 2) the present lack of clear-cut economical alternatives for solid waste disposal and/or resource recovery; and 3) the disruptions and ambiguities caused by "neighborhood nationalism" in the boroughs.

Today, New York City finds itself in a difficult transitional period, the result of changes in environmental regulation and public awareness of ecologically-sound programs. The city's solid waste disposal operations face challenges on many levels. As a result, its disposal alternatives are more limited and more costly. How this transitional period will end is not clear but our forecast suggests that extensive changes in present operations will occur, as well as large capital and operating expenditures.

Figure 1

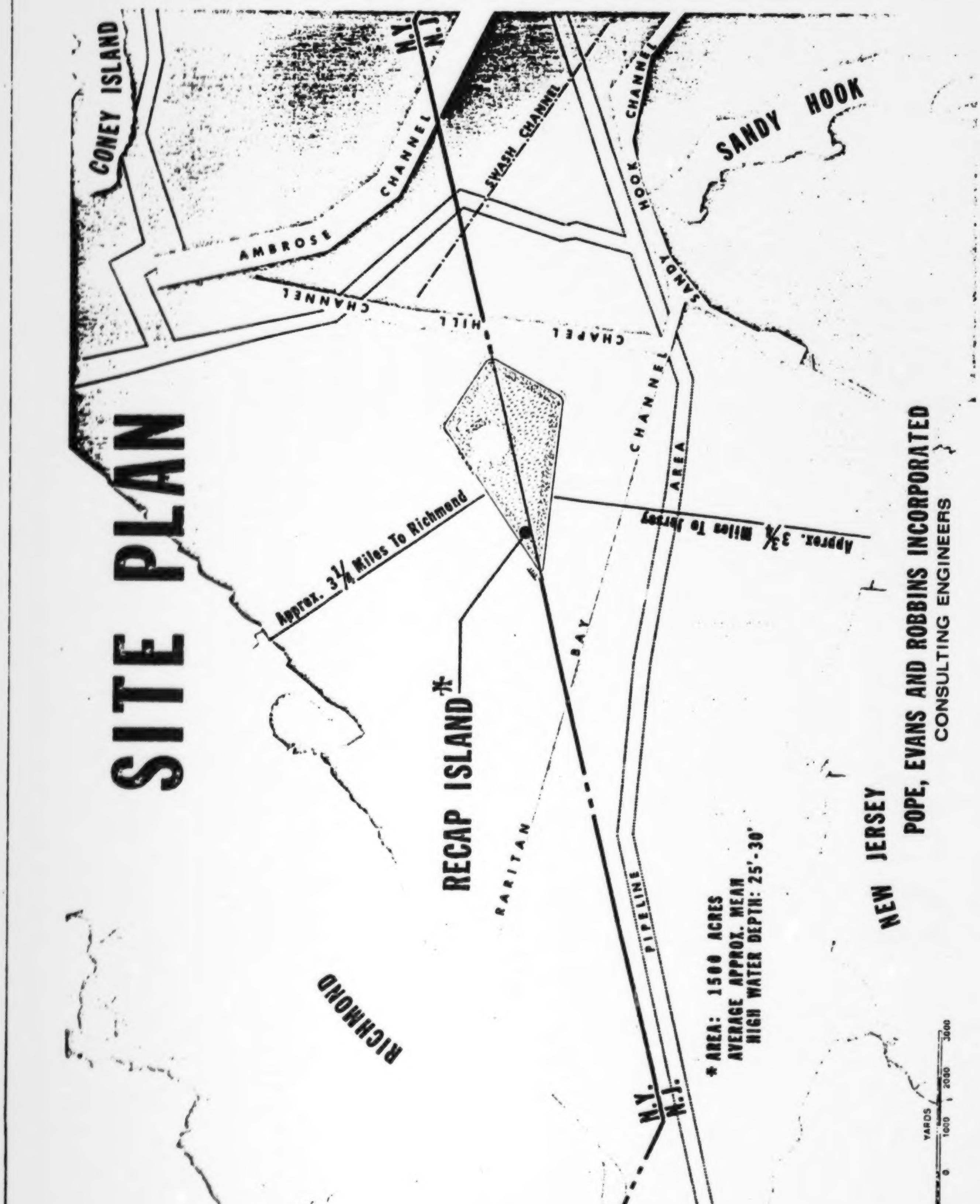
SITE PLAN
CONEY ISLAND
AMBROSE CHANNEL
SWASH CHANNEL
N.Y.
N.J.
SANDY HOOK CHANNEL
SANDY HOOK
CHAPEL HILL CHANNEL
RECAP ISLAND*
Approx. 3¼ Miles To Richmond
Approx. 3¾ Miles To Jersey
RARITAN BAY
CHANNEL
AREA
PIPELINE
RICHMOND
N.Y.
N.J.
* AREA: 1500 ACRES
AVERAGE APPROX. MEAN
HIGH WATER DEPTH: 25'-30'
NEW JERSEY
POPE, EVANS AND ROBBINS INCORPORATED
CONSULTING ENGINEERS
YARDS
1000 0 1000 2000 3000

Figure 2

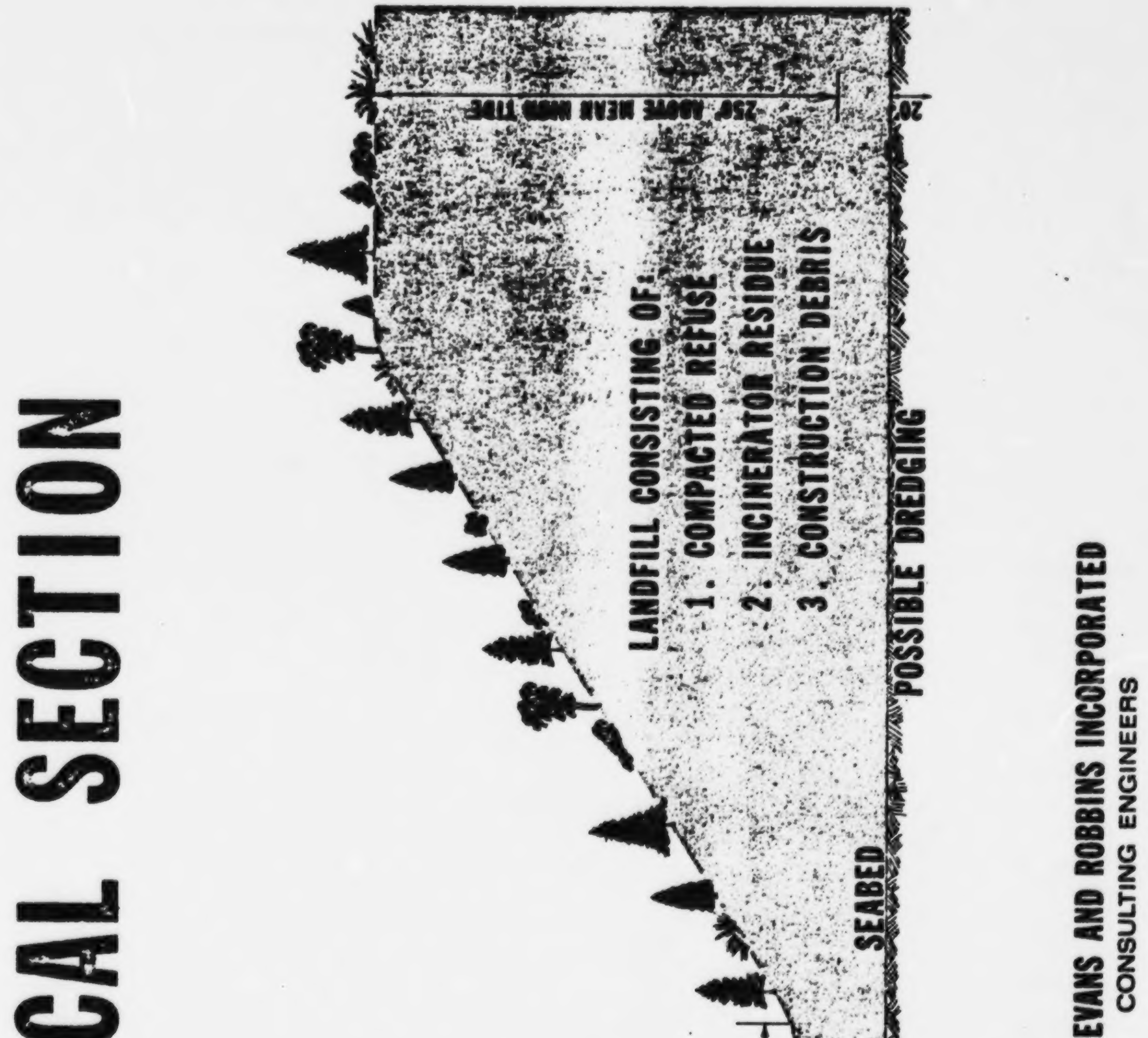
TYPICAL SECTION
MEAN HIGH TIDE
FREEBOARD
CELLULAR WALL
400'
30'
50'
30'
SEABED
POSSIBLE DREDGING
LANDFILL CONSISTING OF:
1. COMPACTED REFUSE
2. INCINERATOR RESIDUE
3. CONSTRUCTION DEBRIS
250' ABOVE MEAN HIGH TIDE
20'
POPE, EVANS AND ROBBINS INCORPORATED
CONSULTING ENGINEERS

Figure 3

New York City:
How New Solid Waste Facilities Are Put Into Operation

Planning and approvals

1. Prepare analyses and plans for facilities.
2. Identify site.
3. Get clearance from the President of the Borough in which the facility will be located. (He has veto power over any project in his borough.)
4. Obtain clearance from zoning board.
5. Develop impact statements.
6. Get preliminary budget approval from city council.
7. Develop preliminary plan (feasibility study).
8. Hold public hearings.
9. Prepare final design.
10. Negotiate construction contract.
11. Build facility.

Financing and appropriations

1. Go to Planning Commission for approval.
2. Get approval from Board of Estimate (Mayor, Borough Presidents, Comptroller, President of City Council).
3. Get items put into the budget.
4. Obtain approval from city council (passes on budget).

Portland, Oregon

Portland, Oregon's largest city, has a population of 382,019 and covers approximately 93 square miles.

Until 1972, Portland operated an open dump as its principal solid waste disposal facility. In recent months, however, the facility has been upgraded to meet state and federal standards. Portland has achieved the initial conversion from open dump to sanitary landfill with relative ease, both technologically and financially. Future upgrading will require greater expenditures, however.

Solid Waste System Background

Collection services for the city are provided by no less than 158 different private collectors operating some 200 trucks. The city issues licenses to these collectors at an annual charge of $100.00 per truck for those operating within city limits, and $400.00 per truck for those operating outside city limits. In addition to these annual charges, collectors pay, respectively, $.75 and $.40 per cubic yard at the city's disposal site.

All of the city's wastes are disposed on land. In 1932, the city constructed an incineration plant, but it was closed down in 1970 because of unsatisfactory operating conditions. In 1962, the Regional Air Pollution Authority required the city to discontinue open burning at its disposal site and, at the same time, required that wastes be compacted (but not covered).

In 1968 and 1970, consulting engineers from Black and Veatch prepared two separate reports on the city's disposal facility. This was a 190-acre open dump with significant leachate problems resulting from the absence of earth cover and surface grading. The equipment used to operate the site has outlived its usefulness and no apparatus is available for loading and hauling cover material.[1] An estimated 268,000 tons of refuse were disposed under these conditions during fiscal year 1970.

Before 1970, the fees collected from private individuals and licensed collectors covered only one-third of the total

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[1] The city's refuse disposal site lacks on-site cover material.

Table 1
Capital Additions

	FISCAL YEAR					
	RECOMMENDED				ACTUAL	
	1971	1972	1973	1974	1971	1972
Landfill scales (2)	$65,000	$ -	$ -	$ -	$ -	$ -
Lug wheel compactor	-	-	-	88,000		82,000
Crawler tractor, D-8 class (2)	77,000	-	93,000	-	77,000	
Self propelled wheel scraper, 20 cu.yd. truck (1)	134,000	-	-	-	-	-
Tower Scraper 20 cu. yd. truck (1)	-	47,000	-	-	-	15,000**
Dump truck (2)	-	14,000	-	15,000	-	14,000
Water truck (1)	-	17,000	-	-	-	17,000
Contingencies	14,000	7,000	7,000	7,000	-	15,000
Annual totals	290,000	85,000	100,000	110,000	77,000	143,000

Source: Black and Veatch, Inc. Report on sanitary landfill and refuse disposal costs for Portland, Oregon. Kansas City, Mo., 1970.

**Unofficial estimate.

cost of operating the refuse disposal site. The remaining portion, as well as any capital expenditure, was provided by the city's general fund.

Recent Developments

Traditionally, the city's refuse disposal unit was a division of the Bureau of Sewage and Refuse Disposal. This bureau was part of the Office of City Engineering. To provide better management and cost control, the refuse disposal unit was separated from the Bureau of Sewage in July 1972, and was reorganized into the Bureau of Refuse Disposal.

The city, following the recommendations of its consulting engineers, has been converting its open dump into a sanitary landfill. In June 1972, Portland was issued a one year permit by the Department of Environmental Quality (DEQ) of the State of Oregon to operate the improved landfill.

A program of monitoring ground water has been instituted, and emergency fire control systems have been improved. New equipment totalling $143,000 will be delivered during fiscal year 1972-1973, and $82,000 is budgeted for the following year. Other improvements, including engineering services, will increase from $30,000 (fiscal 1972-73) to $40,000 (fiscal 1973-74). Total operation cost is budgeted at $850,000 for fiscal 1972-73, and $950,000 for the following year. The purchase and hauling of more than 200,000 cubic yards of cover materials accounts for nearly one-third of this cost. Table 1 indicates the capital additions that were recommended by the consulting engineers in the 1970 report, and the ones actually made.

At the present time, Portland's landfill serves approximately 800,000 people. Two private disposal sites handle demolition materials which are not acceptable at the Portland site.

The Metropolitan Service District is undertaking a solid waste management study, to be completed by January 1974. This study, conducted by private firms,[1] is funded by the State of Oregon. Until then, Portland hopes to be able to operate the present landfill[1] without any major capital expenditures.

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[1] The engineering firms of Cornell, Hayes, Howe and Mayfield, Portland, Oregon; and Metcalf and Eddy, Boston, Massachusetts.

Financing

As of June 30, 1971, the city of Portland had a total bonded debt of $25,620,735. During fiscal year 1970, $30,417,000 in taxes were levied. The assessed value of all property is more than $3.45 billion.

Since 1972, Portland has been operating a sanitary landfill for the Portland area, self-supported by fees. Traditionally, two-thirds of the operating cost of the disposal site came out of the city's general fund. For the first time, during fiscal year 1971-72, solid waste disposal expenditures were covered by the revenues from user charges. Revenues for that fiscal year were $765,375 and total cost of operation was $753,585.

There were several cash flow shortages during the period of transition from the open dump to the sanitary landfill operation. These shortages arose, mainly, because the receivables from private collectors were collected three to four months after expenses occurred. At that time, the general fund was used as a "revolving credit line," although no interest had to be paid. The new user-charges, as indicated below, generate approximately $950,000 per year. However, because of the delays in collecting receivables, the actual cash flow is somewhat less.

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[1] When the new standards for operation of a refuse disposal site were adopted in 1972, the legislature also prohibited the city of Portland from operating its sanitary landfill located in Multonomah County after 1973. However, the city hopes that the law will be amended to allow it to operate any disposal operation which meets DEQ standards.

Rates

Minimum charge (2 cubic yards or less)	$1.00
Each additional cubic yard over 2 cubic yards	.50
Compacted-baled-compressed material (per cubic yard)	.75
Household appliances (in addition to minimum charge)	.50 each
Fill material (clean rock, dirt, cement, brick)	No charge

The Bureau of Refuse Disposal estimates that revenues from user-charges (without any rate increases) will match expenditures until July 1975. To provide better control over the city landfill's income and expenses, the city engineer has recommended that a special disposal fund be established. At present, all revenues flow into the general fund, and all expenses are paid for out of the same fund. But the city's charter does not provide for the establishment of a dedicated fund. The consulting engineers' recommendation that a reserve fund for acquisition and development of future solid waste disposal facilities be established (by collecting 7 percent of gross receipts) cannot be followed for the same reason. At the present time, excess revenue is absorbed by the general fund; none of this excess is earmarked for refuse disposal activities. To overcome some of these difficulties, a new budgeting system will become effective during fiscal year 1973-74. Although the solid waste funds will remain in the general fund, a new information system will account for all revenues and expenditures associated with refuse disposal activities.

The Bureau of Refuse Disposal has no loan outstanding, and it does not expect to have to use the general fund for capital additions over the next two years. After that date, the city of Portland expects to participate in the Metropolitan Service District Solid Waste Management Plan.

Observations

In 1970, 268,000 tons of solid waste entered Portland's landfill. The 1970 Black and Veatch study projected a future solid waste pile of 300,000 tons for 1975, based on an estimated population of 393,000. These figures were used by the consulting engineers as the basis of their recommendation for capital additions. However, because Portland's facility services a far greater number of people--800,000, according to the Bureau of Refuse Disposal--it is likely that expenditures of $300,000 to $400,000 for additional equipment will be necessary over the same period. In addition, the large quantity of leachate discharged into the sloughs[1] will require special pollution-control measures. For example, under-drain systems, pumping installations, dikes, or an aerated lagoon. Capital expenditures for these may run well above $1 million. However, until completion of the Metropolitan Service District Study, the city expects to continue its present course, limiting capital expenditures to the bare minimum.

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[1] "In the order of magnitude of 1.0 million gallons per day (mgd) during the gauging period." (Black and Veatch, Inc. Report on sanitary landfill and refuse disposal costs for Portland, Oregon. Kansas City, Mo., 1970.)

St. Louis, Missouri

St. Louis, located on the Mississippi River, has a population of 572,000 living within 61.2 square miles. The St. Louis Metropolitan Planning Commission expects that the city's population will continue to decline over the next eight years.

One consistent theme emerges in a chronological review of the methods used to finance the St. Louis solid waste disposal system: the willingness of the citizenry to allocate funds for solid waste disposal purposes. Nevertheless, money allocated for solid waste facilities has gone unspent while the city's decision-makers have developed alternative solutions to the solid waste problem.

Solid Waste System Background

The city of St. Louis provides waste collection and disposal services for residential needs only. Commercial, industrial, and multi-family dwelling refuse is collected by private firms and hauled to landfills in surrounding Missouri and Illinois counties. For the last three years, the city has handled an average of about 1000 tons of refuse per day. Collection is scheduled on a one-shift basis over a five-day week. The city uses a fleet of rear-loading trucks to collect solid waste. The cost of purchasing, operating, and maintaining the trucks is paid from general city revenues.

The refuse collected by the city is burned in two batch-fed incinerators, each with a capacity of 500 tons per day. Both incinerators have operated at near-maximum capacity for the last three years. These incinerators were built in 1955 and 1958 and operate on a 24-hour schedule five or six days per week. In 1967, impingement type water baffles and a residual ash conveyor system were fitted to both incinerators. With the baffles, the incinerators are able to meet the city's air pollution standards; however, this is not acceptable according to Federal specifications.

Residue ash from the incinerators is hauled to an abandoned limestone quarry within city limits, about 3 miles from one of the incinerators. At the present rate of residue generation, the quarry will be filled in four or five years.

In 1966, the citizens of St. Louis passed a general obligation bond issue to increase the capacity of one incinerator by 300 tons per day. The city then made plans for the necessary construction.

Before construction on the incinerator began, however, the Union Electric Company of St. Louis suggested that the city consider an experimental project designed to recover energy from solid waste. The utility made the suggestion because it needed new energy sources. City officials favored the proposal. If the refuse were burned in the utility's relatively clean boilers, the need for expensive air pollution control equipment to service the expanded incinerators would be eliminated. Money from the federal government, as well as the utility, was available to reduce the city's costs for the project.

The proposal was accepted in 1968. City officials shelved the incinerator expansion for an indefinite period, and used a portion of the 1966 bond issue to finance the city's share of the experimental project.

Recent Developments

To take part in the energy recovery project, St. Louis had to build a facility to process the refuse into a fuel that would be compatible with the utility's boiler firing system. This facility consists of a mill which grinds the refuse into small particles, and a magnetic separator which removes ferrous materials (about 6 percent of the refuse). A soon-to-be-added air classifier system will separate nonferrous noncombustible materials (about 14 percent of the refuse). This device will permit future recycling of nonferrous materials, and it will also reduce the abrasiveness of the combustible material. The city's processing facility is capable of operating at a rate of 300 tons per day with single-shift operation, and 600 tons per day with two-shift operation. A third shift is needed to maintain the equipment. The noncombustible residuals are currently dumped in the limestone quarry, but plans call for the eventual recycling of all the material. Approximately 13 people are required to operate the facility and to transport the combustible material from the processing plant to the utility's boilers.

The utility was required to add a storage facility for the processed refuse and to make minor changes in two of its boilers. This facility can operate on a 24-hour basis, seven days per week. One maintenance man has been added to the utility staff to check the new equipment.

The energy recovery system is currently handling about 150 tons per day on a five-day basis. This material represents about 5 percent of the heating requirements for one boiler.

The energy recovery project is now exclusively an experimental operation. Blockage and abrasion in the pneumatic boiler feed tubes and excess ash have been the primary problems in the system. St. Louis feels confident that with modifications such as the air classifier, it will be able to solve these problems. The city has dropped all plans for further incinerator modifications and is currently leaning toward extensive use of the energy recovery system in future years.

Financing

St. Louis is governed by a mayor-council system. Normal operating expenses for city services are appropriated by the city council from tax revenues. The city charter requires that general obligation and revenue bonds be approved by a two-thirds vote of the citizens.

At the end of 1970, St. Louis had $117,091,000 of general obligation debt outstanding and $46,862,000 of debt supported by specified revenues. The cumulative legal limit for all types of debt in 1970 was $171,732,220. This limit was set by law at 10 percent of the value of articles and goods in possession of merchants and manufactureres during the previous year. The city's general obligation bonds have been continuously rated by Moody's Municipal and Government Manual as Aa. Recently, a portion of the revenue bonds for airport construction were rerated from Aa to Baa. The total assessed value of all real and personal property in 1970 was $1,538,572,000. These assessments represent a reduction of 35 percent below gross market value.

The two incinerators were financed with two separate general obligation bond issues of $2 million each. Each issue was quickly sold under the Aa rating at interest rates of about 2.25 percent. The issues were sold in 1955 and 1958.

Under a general obligation issue, $3.37 million was raised in 1966 to provide for increased incinerator capacity and air pollution equipment. This bond issue needed a 67 percent vote of approval for passage. It received 68 percent of the vote. Four bond issues out of eighteen were accepted by the voters in the election. The acceptance of the solid waste bonds emphasizes the relative ease with which solid waste financing can be raised in St. Louis.

Approximately $2.5 million of the 1966 bond money is currently available for solid waste financing. The remainder of this issue has been used for the planning of the incinerator capacity expansion and for the city's share of the energy recovery project. The unspent portion of the issue is currently being invested by the city controller.

The experimental energy recovery project required about $2.3 million in capital funds. The Federal Government provided two-thirds of the total through an Environmental Protection Agency grant. St. Louis contributed $189,000 and Union Electric provided $550,000. The Federal Government is also providing two-thirds of the funds to operate the project.

Two-thirds of the cost of the $525,000 air classifier will be financed by the Federal Government. The apportionment of the remaining one-third has not been determined at this time.

Financing for an expanded energy recovery operation has not been established, but the revenue from recycled materials should provide some of the needed funds.

Observations

St. Louis has experienced relatively few problems in raising capital for its solid waste services. It has, however, had problems spending the funds it has raised. Planning for the incinerator capacity project was a protracted process, affected by the uncertainty of changing air pollution requirements. The decision to drop further capacity increases deviates from the original mandate of the voters. However, the decision seems wise in the light of current trends in air pollution regulations.

The decision to experiment with energy recovery carries a high degree of technological risk. Nevertheless, the low cost to the city should justify the experiment. Even if the project should prove unfeasible, the city will not have expended much of its financial resources by exploring this alternative solid waste disposal method.

Saugus, Massachusetts

Saugus, a town of approximately 25,000, is located on the densely populated North Shore[1] of Metropolitan Boston. This figure has not changed significantly in the last ten years.

This case describes the financial and organizational problems in establishing a regional solid waste disposal system. In Saugus, two firms, Combustion Engineering, Inc. and DeMatteo Construction Co., undertook a joint venture called Thermal Energy Systems, Inc. (THESCO). For a number of reasons, the plan never took effect. Had THESCO survived, however, it would have been one of a small number of solid waste disposal systems to be designed, built, owned and operated by a private concern.

Solid Waste System Background

Since 1966, the North Shore Refuse Disposal Planning Board has been searching for a solution to the problems involved in the Saugus dump which is not a sanitary landfill. The dump has been a target for environmentalists' protests against its impact on the region's marshlands, and both Massachusetts and Saugus officials have pressued the owner to upgrade the facility. However, efforts of all have met with little success. The Saugus dump is virtually the only solid waste disposal site currently in operation in the region.

The Regional Board concluded that a sanitary landfill was not feasible because of land availability problems. It then joined in a cooperative planning effort with the General Electric Corporation. G.E. proposed that a solid waste disposal facility be designed and built that could provide steam to its plant in Lynn, Massachusetts. Since G.E. intended to purchase the steam, the economic aspects of the project appeared attractive.

The Regional Board realized that a major solid waste facility, capable of handling the needs of 500,000 - 1,000,000 people of the North Shore, would be costly to build and difficult for any one town to operate. There were also political problems involved in forming a regional authority to finance and run the facility. Thus, the board looked to private enterprise to provide the needed financial and technical capabilities.

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[1] For purposes of this study, the North Shore region is considered to comprise those 15-20 communities, numbering approximately 1,000,000, which presently use the Saugus dump for disposal of 1500-2000 tons of solid waste daily.

Recent Developments

Thermal Energy Systems Co., Inc. was established in September, 1971 to provide and operate a profitable solid waste system for the North Shore. Partners in the joint venture were Combustion Engineering, Inc., a major manufacturer of incineration equipment, and DeMatteo Construction Company, Inc., the owner of the Saugus dump.

Both partners viewed the situation as a promising business venture for two major reasons. First, the monopoly position enjoyed by the Saugus dump was expected to be transferred to the new facility, since the present dump would be closed down with the start-up of the new system. Secondly, there was a known steam revenue source, G.E.'s Lynn plant.

The $30 million system was designed to process 1200 tons per day of solid waste, at a cost of $13 per ton. The primary shredder would reduce waste to six-inch pieces. It would be driven by a 1,000 h.p. motor and would be comparable to an automobile shredder in size. Ferrous scrap would be removed magnetically after the primary shredder operation. Non-ferrous metals and glass would be removed through a heavy density separation process, following the secondary shredder operation. No firm plans were made for the final disposal of these reclaimed materials.

Two silos would provide a total storage capacity of 1,900 tons. Waste would be fed continuously from these silos to the furnaces. Two furnaces, each with a capacity of 600 tons per day, would be designed and fabricated by Combustion Engineering. The electrostatic precipitator would be designed to meet 1975 emission standards. A conveyor from the receiving pit to the secondary shredder and pneumatic pipeline from the secondary shredder to the furnaces served as material-handling systems.

Manpower needs for the facility were approximately ten to thirteen men per shift, or 30 to 40 per day. Operations would be staggered so that each shift would have about the same number of men. Incineration would take place around-the-clock. Waste delivery, weigh-in, and routine maintenance would take place during the first shift, and shredding on the second and third shifts. A service representative from Combustion Engineering would remain on-site for the first full year of operation, to provide expert technical assistance to the operating staff.

Financing

Saugus has an A-1 general obligation bond rating, with approximately $8 million bonded debt outstanding. The assessed property value is approximately $200 million, and the tax rate decreased from $41.00 per $1000 assessed valuation in 1969 to $35.20 in 1970.

A recent Massachusetts law, passed in direct response to the North Shore solid waste problem, allows communities to establish an Industrial Development Financing Authority and to arrange for the financing of solid waste systems through this authority. The financing mechanism is an industrial revenue bond which, after the appropriate Internal Revenue Service rulings, carries tax-free interest. The industrial revenue bonds are in no way guaranteed by the issuing community, but rather by the private corporation for whose use the facility is intended (THESCO). Thus, the corporation must establish its own credit. In return it is able to obtain financing at an interest rate 1-to 2-percent less than regular (taxable) corporate debt.

Under the new Massachsuetts law, the Saugus town meeting established the Industrial Development Financing Authority and the specific authorization for solid waste system financing with Saugus industrial revenue bonds. Saugus did not contemplate favorable treatment from THESCO, relative to other user communities, in regard to dump charges at the new facility; but there were to be significant benefits for the town in the form of industrial real estate taxes.

Although Saugus would not be responsible for repayment of the debt, there were still some political problems involved in getting town meeting approval. However, voter uncertainty and fear of being forced into undertaking a potentially risky venture were eventually overcome after considerable legal interpretation and explanation.

Since THESCO viewed the financing issue as highly confidential, it is not known precisely how the corporation intended to finance the project. Discussions with THESCO and Saugus officials indicated that industrial revenue bonds were to be used at some time, but that the complexities of this mechanism would mean that short- or medium-term alternatives would be needed to get the project in motion.

The industrial revenue bond mechanism involves significant legal and administrative complexities. It requires a considerable amount of preparatory groundwork on the part of the interested corproation. The first major hurdle is to obtain an Internal Revenue Service ruling on the tax-exempt status of the project. (Although THESCO planned to use alternative financing in the project's initial stages, it took steps to obtain the IRS ruling before commencement of work, to ensure the availability of the cheaper financing at a later date.) An estimated three to six months are necessary for this procedure. This includes the preparation of an IRS ruling request by the corporation and bond counsel, and the IRS review procedure.

Since industrial revenue bonds are secured by revenues from the solid waste disposal facility, the corporation must take steps to guarantee a reliable source of long-term revenue. This was a major task for THESCO, since it required long-term commitments from potential steam customers and from potential user communities. Late in 1972, an agreement was reached with G.E. to purchase steam from the Saugus facility at specific rates, on a long-term (15-20 year) basis.

Little firm progress had been made, however, in contracting with user communities for solid waste dumping, and THESCO faced major obstacles. The proposed dump fee was $13 per ton, compared with a $6-$7 charge per ton for the Saugus dump. A number of potential users had publicly voiced strong objections to what they considered to be the monopoly power of THESCO. At the time of the termination of the joint venture, it is understood that THESCO had no firm commitment from any potential user. Another politically sensitive factor was the long-term nature--20 years--of the contract that THESCO sought to obtain.

Although the exact intentions of the firm are unknown, THESCO may have planned to user short-term private financing to build the project. In fact, shortly before termination of the project, the company announced that construction would begin "within the month." As the facility neared completion, user communities would have been faced with the reality of the dump closing and would have had no choice but to sign on. This would eventually have given THESCO the security required for the industrial revenue bond issue.

Observations

Although the THESCO joint venture was terminated, it is understood that DeMatteo Construction Company is planning to pursue the project. It is not known how this firm will proceed. The major obstacle to industrial revenue bond financing continues to be obtaining contracts with user communities.

Informal discussions with a former THESCO partner indicate that the venture may have been terminated because of disagreements between the partners, and not because of problems with the financing mechanisms. Despite legal, administrative, and security problems, the industrial revenue bond appears to be a viable financing alternative for the private corporation.

Seattle, Washington

Seattle, with 531,000 inhabitants and nearly 92 square miles, is the largest city in the state of Washington and the county seat of King County.

This case illustrates the effective and smooth functioning of a municipal solid waste utility as a subdivision of another city agency.

Solid Waste System Background

Since 1961, Seattle has operated a system of public utilities--solid waste, water, sewerage, and electricity. This unusual feature makes Seattle an interesting example of solid waste management.[1] As part of the City Engineering Department, Seattle's solid waste utility provides centralized management for its activities. The utility subcontracts collection of residential wastes, owns and operates two transfer stations, and leases two landfill sites. A team of five inspectors is responsible for the enforcement of the city's standards for solid waste handling.

During 1964-1965, a team of consulting engineers from Black & Veatch, Inc. conducted an extensive study to determine the most effective solid waste management system.[2] Although the consultants recommended incineration, the mayor's office decided that a transfer-sanitary landfill system would be more appropriate to the city's needs.

Mandatory collection from households is performed by two separate private companies working under five-year contracts with the city.[3] Most commercial and other wastes are collected by licensed independent haulers. In 1966, Seattle converted its direct-haul system to a transfer-station operation, utilizing suburban landfill sites. Two large transfer stations with a maximum daily capacity of 2000 tons were constructed, each to service half the population. The total capital cost for the two transfer stations was $1.9 million. Figure 1 presents additional information on the existing disposal system.

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[1] Two other cities in the state of Washington operate on this public utilities concept: Tacoma (population 155,000) and Spokane (population 170,000).

[2] Black and Veatch, Inc. Report on refuse collection; review of present practices and contract. (Prepared for the city of Seattle, Washington.) Kansas City, Mo., 1967.

[3] The city is engaged in negotiations to reduce the duration of collection contracts from five to three years.

Each year, Seattle moves approximately 310,000 tons of solid waste from its transfer stations to sanitary landfills. To haul these wastes, the city operates and maintains a fleet of 18 tractors and 36 long-haul trailers of 100 cubic yard capacity each.[1] The total investment in tractors and trailers is approximately $1.8 million.

The Solid Waste Utility leases two landfills located outside city limits, at a cost of $0.30 per ton (Figure 1). The city invested approximately $320,000 in eight bulldozers and $500,000 in miscellaneous equipment to operate these landfills. In 1971, the total tonnage at the landfills was approximately 400,000 tons.

Gross revenues for the solid waste utility were $6.5 million in 1971. Total collection-disposal cost per ton of waste is $20.00, of which $15.50 is for collection and $4.50 is equally distributed over transfer, long-haul, and burial.

Recent Developments

Late in 1971, Seattle improved its weighing system at the transfer station, to increase both the throughput of vehicles and transaction security. An IBM System 7 automated truck weighing system was installed at each location, at a total cost of $150,000. The city "anticipates that the new system will result in cost avoidance in excess of $100,000 over the next ten years."

Because the Midway Landfill Site is running out of space, the city took an option on another large potential disposal site. In February 1973 the mayor's office asked the engineering department to prepare a study of the collection options open to the city, including municipally-run garbage collection. The purpose of this study is to limit future rate increases growing out of increasing collection costs.

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[1] In reality, the Engineering Department maintains the rolling equipment and bills the solid waste utility.

Figure 1

A. TRANSFER STATIONS: open to all private citizens, rubbish haulers, gardeners, municipalities, school districts, county agencies, industries, etc. Accept all materials, excluding large timbers, car bodies, waste oil or other flammable liquids.

South Transfer Station

opened: September 27, 1966
Cost: $800,000
area site covers: 7 acres
operates: 24 hours a day
total tonnage: (1971) 137,399

North Transfer Station

opened: January 1, 1968
cost: $1,100,000
area site covers: 4.5 acres
operates: 9 hours a day
total tonnage: (1971) 177,421

B. SANITARY LANDFILLS

Midway Landfill

opened: January 31, 1966
cost: $0.30 per ton
area site covers: 60 acres
remaining life: 1-2 years
total tonnage: (1971) 188,950

Kent-Highlands Landfill

opened: July 15, 1968
cost: $0.30 per ton
area site covers: 100 acres
remaining life: 5-7 years
total tonnage: (1971) 208,097

Source: City of Seattle - Solid Waste Utility

The city will be part of King County's regional solid waste management plan, to be completed within the next eighteen months.[1] Up to that date, no major capital expenditures are expected.

Financing

As of December 1970, bonded debt for the city of Seattle was $329,497,684, of which nearly 72 percent was in utility bonds. Tax collections for 1971 amounted to more than $25 million.

Seattle's solid waste utility is a self-supporting municipal utility: its obligations (interest and principal) are payable solely from its own revenues. Revenues ($6.5 million in 1971) are derived from user-charges.

Rate schedules are established by the City Council for different classes of users, from single-family residences ($2.70 per month including collection) to county agencies and industrial customers ($4.50 per ton at transfer stations). The following rates were established for users of the city's disposal sites and transfer stations:

Passenger cars without trailers:

  Operated by city residents--------------No charge
  All others--------------------------------$0.50

Minimum charge for cars with trailers and all other vehicles---------$1.25 per load

Refuse deposited at disposal sites--------$1.50 per ton

Refuse deposited at transfer stations-----$4.50 per ton

Cash transactions at transfer stations are approximately $700,000 annually. Credit customers make up most of the business.

Tax on the Solid Waste Utility's gross income is 7 to 8 percent to the city and 1 percent to the state. To date, the Utility has not issued bonds or made bank loans to finance its capital expenditures. To pay for the construction of the transfer station, $2 million was borrowed from the general fund at a rate of 4 percent interest. The rolling fleet was acquired through a $1.5 million loan, at 1.5 percent interest, from the operating fund of the engineering department. At the present time, approximaely $2 million in loans from these two sources are outstanding and will be repaid by 1979.

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[1] This plan will investigate several processing methods, including shredding, baling and recycling.

The Solid Waste Utility needs to have its budget approved by the Engineering Department, the City Council and the Mayor's Office. In the future, the utility plans to use the source of financing best suited to its needs. If the current depressed economic situation persists, it will not use general funds as a source of capital. As one official stated, "Garbage trucks will not compete with police cars." The Utility may use bank loans for the financing of equipment with less than five years useful life and exceeding $4 million in cost. Otherwise, it could issue its own utility bonds. Based on yearly audits these bonds are rates Aa. However, no major capital expenditures are expected in the near future, except for replacement of obsolete equipment.

Observations

Seattle manages its solid wastes very efficiently. The organizational structure provides centralized management of all solid waste activities, thus allowing maximum economies of scale. There is, however, a problem in the definition of a utility. The Solid Waste Utility in Seattle is not really different from the traditional bureau of solid waste in any other city. In theory, a solid waste utility should be directly responsible to the municipal executive. In Seattle it is part of the Engineering Department. Its reliance on general or operating funds from another municipal department minimizes the distinction between the two sectors. However, the administrative structure of Seattle's Solid Waste Utility allows for maximum flexibility in terms of long-term and short-term borrowings (e.g., utility bonds, bank loans, general fund, city engineering operating fund). This means that financial management can be more effective than in many other situations.

Allegheny County and Pittsburgh, Pennsylvania

Allegheny County in southwestern Pennsylvania covers a total of 730 square miles, including the 55.5 square miles of Pittsburgh, the county seat.

The county's 1970 population was 1,654,263; the population in 1980 is expected to reach 1,755,268. Pittsburgh contributes about one-third of the county's population with 537,855 in 1970. This is expected to drop to 522,795 by 1980.

Allegheny County provides an example of a regional financing strategy for a solid waste disposal system and illustrates the type of system which can evolve when abundant land suitable for sanitary landfill is available.

Solid Waste System Background

Figure 1 summarizes the collection methods used for domestic refuse in Allegheny County in 1971.

Individual private contractors collect all commercial and industrial waste in the county. Approximately 50 percent of the refuse collected is exported to surrounding counties for final disposal. The refuse which remains is disposed of primarily in open, privately-owned dumps rather than in "sanitary" landfills. To date, none of these has been approved as a "sanitary" landfill by the Pennsylvania Department of Environmental Resources. The Allegheny Department of Solid Waste Systems anticipates that the owners of these facilities will make the necessary operational changes in the near future, and that permits will soon be issued.

The average cost of collecting and disposing of domestic refuse in the county is estimated at $2.35 per household per month. This figure includes all capital and operating costs.

Using 140 trucks, the Pittsburgh Public Works Department provides domestic refuse collection services for about 85 percent of the city's population. The budget for refuse collection was about $5,200,000 in 1972 or $9.67 per capita. This budget does not include maintenance or fuel costs for the trucks.

The remaining 15 percent of Pittsburgh's refuse is collected by National Disposal Company, a private contractor. A recently signed ten-month contract required Pittsburgh to pay National $89,000 per month for this service. The city is currently planning to take over this collection service when the contract expires, and expects to be able to provide comparable service for about $57,000 per month.

The refuse collected by the city and by National Disposal Company is taken to a privately-owned transfer station within the Pittsburgh city limits. The owner of the station, the Aloe Coal Company, then transports the refuse in eleven compactor trailers to its private landfill, an abandoned strip mine 18 miles away. Approximately 1,000 tons of refuse is processed through the station each day. Aloe has 20 men working at the transfer station and three at the landfill site.

In 1966, through competitive bidding, Aloe received a contract to dispose of Pittsburgh's domestic refuse at a rate of $3 per ton. Aloe lost money for 1-1/2 years under this contract, and in 1968 renegotiated the rate and added an escalator clause which set the transfer-station-user charge as a function of the local cost-of-living index. In 1968 the charge was $6.00 per ton. Though the contract terminated in April 1973, Pittsburgh expects to exercise two six-month extension clauses built into the agreement.

The current user charge is $7.12 per ton. Aloe also accepts some commercial refuse at the station for $30 per ton.

Recent Developments

The passage of the Pennsylvania State Solid Waste Management Act of 1968 (Act 241) prompted Allegheny County to initiate a long-range solid waste plan. The office of Solid Waste Management Systems, prepared the plan and is now attempting to implement it.

The plan calls for the establishment of ten disposal districts in the county. Each district is required to provide a disposal or handling facility to serve the residents and the commercial-industrial establishments located within that district. Six of the districts will use privately-operated landfills and the remaining four will have transfer stations. Collection arrangements in each district will be determined by the individual municipalities and are expected to remain about the same as shown in Figure 1.

The county is currently making arrangements with present operators of landfill disposal sites to accommodate designated volumes of refuse in accordance with state and county health regulations. The county is also acquiring and establishing land reserves near the disposal sites, to make certain that disposal sites will continue to be available at a reasonable cost.

According to Allegheny's plan, the county would purchase the Aloe Coal Company's transfer station and would build three more stations. As of this writing, one of these stations has been constructed within the Pittsburgh city limits at a cost of $750,000. Two more stations are planned outside the city.

Allegheny county is currently soliciting private proposals to operate the transfer stations and to provide transportation to the landfills. If a financially-feasible arrangement cannot be negotiated, the county will operate the stations and transport system itself. The county plans to charge $5.00 for each ton of refuse processed through the stations; landfill charges will be determined by the private owners.

A look at the strategy's impact on Pittsburgh reveals that the city would receive a $2.12 per ton reduction in disposal costs as well as a reduction in transportation expenses because of the judicious placement of the transfer stations. Pittsburgh's solid waste officials currently favor the project and expect private collectors to give their support as well. County officials anticipate that disposal facilities within its borders will ultimately handle 75 percent of the refuse generated. Adoption of the project depends in large measure on Pittsburgh's ratification. Whether or not traditional county-city rivalries will hamper implementation of the strategy remains to be seen.

Financing

Allegheny County's financial affairs are administered by 3 selected commissioners who are empowered to issue "commissioner's bonds" up to 5 percent of the county's assessed value. The commissioners can also levy property taxes to service the debt and to cover operating service costs. Simple majority voter approval is required to issue debt above the commissioners' authorized limit. Financing through the commissioner-bond method facilitates the fund process since voter-approval is only required once.

As of January 1, 1970, the county had a bonded debt of $226,521,183 and an assessed value of $4,899,092,867. Total county revenues in 1970 were $78,275,961.

Pittsburgh is governed by a mayor-council system. In 1970 Pittsburgh's bonded debt was $89,754,000 on a total assessed value of $1,331,831,872. The city's 1970 revenues, generated primarily by real estate and income taxes, were $92,606,964.

The bonds of both Allegheny County and Pittsburgh were designated rates A-1 according to the Moody Index.

The majority of refuse disposal facilities in Allegheny County are privately financed by individual owners. Financing comes almost exclusively from retained earnings. The Aloe Coal Company financed its transfer station, also with retained earnings, at a cost of $1,361,000. The land for the station is rented from Pittsburgh for $1 per year. Most of the landfills occupy old strip mining sites.

Pittsburgh pays for its collection services from normal city revenues. This includes all equipment purchases and maintenance.

The county plans to finance the capital costs of its regional plan with commissioner bonds. County officials currently anticipate that about $4 million will be required to complete the plan. Initial planning has been financed with a $147,000 EPA grant, and the county expects to sell its bonds with relative ease.

Observations

The Allegheny solid waste strategy relies heavily on voluntary participation of private refuse collectors. To encourage these organizations to use the county's disposal facilities, the plan has been designed to cause the fewest possible changes in the present collection system. This strategy can be implemented with a relatively small cost to the county, but the voluntary aspects represent a risk. The county will have to mount a long-range marketing campaign to convince refuse collectors to participate. Once private collectors approve the plan, Allegheny's officials can focus their efforts on cementing satisfactory relations with them.

Financing the regional plan does not present a problem. The Solid Waste Management Systems Office has convinced the commissioners of the utility of the plan, and the commissioners are willing and able to issue the required debt. Pittsburgh should be able to finance its collection service from current city revenues.

Arbuckle Regional Development Authority, Oklahoma

The Arbuckle Regional Development Authority is an association of seven small rural communities located in southern Oklahoma. The largest community has a population of 5,158; none of the others has a population over 2,500.[1]

The Arbuckle Authority is one of a small number of community associations in the country which have relied on grants or loans from the Farmers Home Administration to finance solid waste system improvements. In this case, both the collection and disposal systems will be financed in full by a long-term loan. This source of funds is quite limited, however, and the program is expected to be terminated at the end of fiscal 1972-73.

Solid Waste System Background

In 1969, the executive committee of the Southern Oklahoma Development Association (SODA), the umbrella agency under which Arbuckle lies, selected solid waste as a priority consideration. Cooperating with the state health planner, SODA developed solid waste collection and disposal practice guidelines. The proposed system called for hand pick-up and delivery to numerous landfills in the multi-county area. Normally, SODA would have taken the primary role in financing the project through a special trust fund set up for such purposes. Since its charter forbade the use of those funds for solid waste, however, other sources had to be developed.

Recent Developments

Initially, SODA applied for funding through the federally-based Environmental Protection Agency, but their request was denied. In 1971 the executive committee then hired a full-time engineer who drafted a new plan that incorporated a drop-box system.[2] With this second draft, SODA applied for a loan through what seemed to them to be the only other alternative, the Farmers Home Administration.

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[1] 1970 Census of Population.

[2] Under the drop-box system, large capacity containers are placed at strategic locations to facilitate the collection process. This system has been operative in Chilton County, Alabama.

The FHA is empowered to make grants and/or loans to rural communities for water and solid waste facilities. Although grants and loans are presently limited to communities of under 5,000, the Rural Development Act will eventually consider communities with populations of up to 10,000.

Loans up to 40 years at 5 percent are provided to a single community or to a group of communities. In the three years since 1970, the FHA has approved 64 grants and loans totalling $5,411,900. Although the Administration has recently terminated its grant program, several loan applications are still under consideration.

After initial evaluation of SODA's loan application, the FHA concluded that the proposed collection equipment would exceed state bridge load limits.

SODA then hired a new project manager to prepare a plan acceptable to the FHA. Subsequently, a third proposal for the system was submitted to the FHA. This plan proposed use of lighter-weight, side-loading trucks, small three-yard containers, and a minimal number of landfill sites. FHA approved the plan with certain restrictions.

Financing

In approving SODA's proposal, the FHA required that the project be restricted to a maximum of four counties. Solid waste fees were to be attached to city water bills. Thus, the cities were the only municipal units with any real means of enforcing compliance. There was no legal requirement for all cities in a county to adopt the plan, so subscribers had to be solicited on a city-by-city basis.

Four counties expressed interest in the project and were joined together in the Arbuckle Regional Development Authority. These four counties subsequently applied for a $775,000 loan for a side-loader system. The FHA was willing to grant this loan, provided that the number of cities contracting was sufficient to insure adequate cash flows and pay-back. After some time, two of the counties were able to contract with a total of seven cities, but the two others could not obtain a satisfactory number of subscribers. FHA approved a revised loan of $430,000 for the more successful counties. The loan, which became effective in January, 1973, will run for 40 years at a

5 percent interest rate. FHA officials anticipate making a loan to the two remaining counties, at some later date.

Since its creation, the Arbuckle Regional Development Authority has invested $430,000 in five packer trucks, 1,600 containers, one bulldozer, and site preparation and miscellaneous start-up costs.

The two-county system will service 5,085 dwelling units and 335 businesses on a twice-per-week pick-up basis. Refuse will be collected from containers placed intermittently on residential property and commercial lots. All refuse is to be disposed of in a single landfill site. It is estimated that daily generation of refuse will fall between 20 and 30 tons.

No additional sources of financing will be used, and the system is intended to be entirely self-sufficient. Fees will be $2.50 per residential unit per month, and $1.50 per cubic yard per pick-up for commercial establishments. As mentioned earlier, these fees will be added to each city's water billings. Each city will be able to retain 3 percent of all the charges it collects. A review of this system by the EPA technical assistance personnel indicates that cash flows should be adequate to support all operating expenses and debt service requirements.

Observations

The Arbuckle Authority now has a solid waste collection and disposal system which will comply with both Oklahoma and Federal legislative standards, and which is capable of generating sufficient revenues to cover expenses. This, of course, is a substantial improvement, since no solid waste services existed in the past. On the other hand, several aspects of the current system need to be examined.

First, the system as it now exists will be serving only some 14,500 residents, or about 40 percent of the combined population of the two counties. This assumes that the contracting cities will be able to enforce participation in the system by all their residents. Compliance may, in fact, be very difficult to enforce since these residents have never paid any sort of fee for solid waste services, and are now spending $30 per year per household.

Second, the system involves the placement of containers directly on residential property. This will undoubtedly create acceptance problems.

Third, calculations by EPA personnel, who provided technical assistance to the Authority, indicate that the system "is overdesigned, both in regard to number of trucks and amount of storage space provided." Excluding considerations of back-up reserve capacity, the EPA estimated that alternative systems with equivalent handling capacities could have been purchased for $96,200 to $127,400.[1] This compares unfavorably with the Arbuckle system's capital cost of $335,978. If this is correct, residents of the seven cities are paying considerably more than necessary for a disposal system.

A final point concerns the source of financing for the project. In conversations with the administrator of the Authority, we were told that the system would not have been implemented had not an external source of capital been willing to provide 100 percent financing. Why this money had to come from the Federal Government is not clear, however. There is no indication that local sources of financing, such as banks or county bonds, or contracting through private waste handling firms were given serious consideration. In the basis of this experience, it is difficult to assess the necessity for Federal participation in the financing for this type of project.

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[1] Office of Solid Maste Management Programs, Systems Management Division in Cincinnati, Ohio.

Baldwin County, Alabama

Baldwin County, in southern Alabama, lies on the eastern shore of Mobile Bay and along the Gulf of Mexico. Its 1970 population was 59,382, representing a 21 percent increase over the 1960 census. The county seat and largest city is Bay Minette, with 6,722 people.

Baldwin County has solid waste problems typical of many rural counties. With few sources of capital funds available, the county has chosen to avoid major investment in either collection or disposal equipment by franchising all operations to private contractors. The county has been divided into collection districts and each resident contracts separately with private haulers. The county has maintained total operating costs at reasonable levels by specifying the type of collection and disposal.

Solid Waste System Background

In 1969, Alabama passed its first solid waste legislation, requiring that each county or municipality have adequate solid waste collection and disposal services within two years after enactment. This act was amended in 1971 to allow for a one-year grace period, since many communities had been unable to comply with the two-year limit. At the time this law was passed, six of the ten municipalities in the county performed their own collection services; two towns contracted with private collectors; and two towns provided no services. Refuse was collected from approximately 35 percent of the county's residents and delivered to open dumps at the outskirts of the towns. In all, there were 16 private collectors operating in the county. These were largely unregulated with regard to quality or fee charges.

Recent Developments

The county health officer in charge of enforcing the new solid waste legislation convinced the Baldwin County Commissioners to hire a solid waste manager. Several different types of systems were investigated. One was the "green box" EPA demonstration system in Chilton County, Alabama. Under this operation numerous 4-cubic-yard refuse containers were placed throughout the county. Refuse would be collected by front-end loaders with a capacity of 30 cubic yards and delivered to a sanitary landfill. To adopt this system, Baldwin County would have to purchase 245 4-cubic-yard containers and at least two front-end loaders, at a cost of approximately $125,000. Operating expenses were expected to be $125,000 per year at the start. Later, yearly costs would rise as maintenance and replacement costs increased. The county commissioners explored the possibility of raising additional revenue to finance such a project by increasing the beverage can tax. For undisclosed reasons, a law suit was filed by a citizen's group to prohibit such a move, and the proposal was subsequently dropped.

The county commissioners believed that a major educational and public relations program was an essential prerequisite to using tax money to finance a solid waste disposal plan.

While attempting to design a reasonable collection plan, the county implemented its decision to design and construct a sanitary landfill. (It appears that no other disposal alternatives were formally considered.) Since 80 percent of the population is located in the southern half of the county, considerable effort was made to locate a site in this area in order to reduce the average haul distance. Eventually the county located a 320-acre site which could be leased from the U.S. Navy for $1 per acre per year.

Several years earlier, Baldwin's highway department might have operated the landfill site. However, since a county consolidation plan had transferred highway operations to the state no channel through which the county could funnel solid waste disposal responsibilities existed. Rather than set up a new agency, Baldwin prepared sanitary landfill operating specifications and released them for bidding by private contractors. Four bids were submitted ranging from $1.42 to $3.00 per ton. This compared with county-prepared estimates of $1.72 per ton at a level of 65 tons per day (or 85 percent collection).

Baldwin then drew up a contract with the lowest bidder, a local earth-moving contractor. Its provisions were as follows:

1. The county would provide the landfill while the contractor would purchase all heavy equipment needed to dispose of the refuse and operate the site. The contractor would charge Baldwin County a fee.

2. Disposal fees would be paid at the site and the county would guarantee receipts equivalent to 20,000 tons per year.

3. Fifty-five percent of scale receipts for tonnages over 30,000 tons per year would revert back to the county to help cover initial capital outlays required for site preparation.

To meet the guaranteed minimum tonnage, the county had to encourage reorganization and expansion of collection services. Since neither the county nor the cities wished to assume responsibility for collection themselves, it was suggested that the sixteen private collectors collaborate to handle collection in accordance with county requirements.

The collectors subsequently formed an association and negotiated a five-year contract with the county.[1] Under the terms of the contract, the collectors had to provide curbside service to anyone requesting it. The county would require the closing of the existing open dumps to encourage the use of the service. At the same time, each collector was required to obtain a $1000 permit to continue operations, and had to put up a $50,000 performance bond. This requirement was intended to eliminate companies lacking financial stability. In the end the association numbered 10 participants.

Under the present system, residents are not required to subscribe to this collection service. They have 2 alternatives:

1. Residents can personally deliver their refuse to the landfill and pay a charge of $1 for any load up to 1400 pounds, and $1.42 per ton for the excess.

2. They can dispose of refuse on their own property providing that they conform to requirements applicable to landfill operation.

Currently, between 40 and 50 tons of refuse are delivered to the landfill each day. Based on a 3 pound per person per day refuse generation rate, this represents approximately 55 percent collection coverage, or 12,500 to 15,000 tons per year. This falls far short of the guaranteed minimum of 20,000 tons. The $4,500 to $7,500 lacking in receipts will have to be appropriated out of the county's general fund.

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[1] Competitive bids were not legally required since no county money was to be committed. Furthermore, a state law prohibits the awarding of exclusive francises for such services.

All residents in Baldwin County are subject to the terms of these collection and disposal arrangements except those living in Bay Minette, the county seat, which owns and operates its own collection trucks and sanitary landfill. According to the county solid waste manager, monthly operating expenditures for disposal average between $1,200 and $1,500. In 1971, Bay Minette spent approximately $81,000 for all its solid waste services. The city has one army surplus bulldozer and an old front-end loader with which to operate its landfill. The landfill is located 30 miles outside city limits. No special charges for solid waste are levied. The city has shown no interest in using the county's system.

Financing

The outstanding general obligation bonded debt for the county was $1,125,000 as of September 1969. Assessed value for 1968-1969 was $73,896,800. Capital outlay bonds are initiated by the County Board of Commissioners and are payable out of a 5 mill county-wide ad valorem tax. Other sources of county revenue are cigarette and beverage sales taxes.

Under the terms of the contract with the landfill operator, the county was required to provide a site ready for use. Preparation costs of $27,000 included 1-1/2 miles of paved access road, fencing, a field office, a 50-ton portable scale, soil analyses, and digging a 70-foot well for leachate testing. This money came from an excess in the county's courthouse amortization account. As indicated earlier, the contractor will gradually reimburse the county for this expenditure out of its scale receipts, once deliveries exceed 30,000 tons per year. No capital investment in heavy equipment was required since this is supplied by the contractor. Operational expenses for the county are minimal, consisting of a monthly electric bill, a lease payment, insurance, and the salary of the county solid waste manager. These expenses will be paid out of general county revenues.

The landfill operator uses a tractor bulldozer full-time, and an elevating scraper part-time at the site. Personnel include two full-time employees and one part-time scraper operator.

Observations

Baldwin County has adopted a strategy calling for a minimum commitment of county funds to solid waste collection and disposal. They have been able to do this by contracting with private companies to handle both functions, while maintaining a degree of control through performance bonds and ownership of the disposal site. Admittedly, costs to operate the site are artificially low, but overall system costs average $20 per ton,[1] a reasonable rate for a rural area. Since the county made no significant capital outlays, capital financing was never an issue.

Winning community support for the system remains a serious problem for Baldwin County. Since 65 percent of the population has never had solid waste services and has never paid any sort of service charge, many people are reluctant to contract with private collectors. Instead, they either hand-deliver their refuse to the collection site, or bury it on their own property, supposedly in accordance with strict standards, or dump it wherever possible. Hand delivery is inefficient and undesirable. The second alternative appears to be used very little. Since Baldwin must subsidize landfill operating costs until 20,000 tons are delivered annually, efforts to increase the number of subscribers to collection services rank first among county priorities.

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[1] Calculated based on a $2.25 per dwelling per month charge and assuming: (1) 3 lbs. of refuse per capita per day, and (2) 2.5 persons per dwelling.

Brevard County, Florida

Brevard County occupies a strip of land in East-Central Florida, 75 miles long and 25 miles wide. Three major cities lie within its borders, and the county's population in 1970 was 230,000, up 106 percent over 1960, and 972 percent over 1950.

Brevard County is currently seeking to finance county-wide solid waste disposal system including a landfill and a transfer station. The county's efforts to select the best system, to ensure the cooperation of all political subdivisions, and to evaluate financing alternatives, provide an example of sensitive and careful handling of the solid waste problem.

Solid Waste System Background

Brevard County has never used incinerators. Although some municipalities and county-franchised collectors operated landfills four or five years ago, sites were owned by the county. As part of Brevard's long-range program for improved solid waste disposal, the County Utilities Department took over operation of all landfills in May, 1971.

Recent Developments

Increasing concern about the environment combined with the pressures of population growth to bring the solid waste disposal problem to the fore in Brevard County. A Florida state law against open-burning dumps underlined the urgency of developing new disposal techniques. In 1972, the county was awarded a demonstration grant by the EPA. Here is how Brevard County described the deficiencies in its present solid waste system:

1. Lack of regionalization making small local communities unable to develop technical progress in handling and disposal techniques;

2. Inadequate and inequitable rate systems and lack of constant review;

3. Erratic enforcement making solid waste operations more a nuisance than a benefit;

4. Lack of resource recovery program consideration;

5. Inadequate cost controls from a lack of cost center concepts and failure to use accounting techniques;
6. Lack of public understanding of solid waste management problems; and
7. Insufficient concern with environmental impact of solid waste systems.

In preparation for a solution to the solid waste disposal problem, the county persuaded the Florida legislature to pass a special state law in 1967 (revised in 1970) that would enable the Board of County Commissioners of Brevard County to:

1. Construct, operate, and maintain a solid waste disposal system for the use and benefits of the inhabitants and municipalities of Brevard County;
2. Compel the inhabitants of Brevard County to use the disposal system established by the county;
3. Prescribe and collect fees or other charges for the use of such a system and pledge such revenues as security for the payment of bonds issued under said statutory authority for the construction of a solid waste disposal facility;
4. Pledge non *ad valorem* revenues of the county in support of required interest and principle payments on said revenue bonds.

The power given to the county to enforce the exclusive use of its disposal system is an outstanding feature of the legislation. This prevents city-county rivalries from undermining the regional disposal strategy.

On December 30, 1970, the board of county commissioners directed the joint venture team of Leonard S. Wegman, Inc. and Reynolds, Smith, and Hills, Inc. to perform an in-depth study of solid waste disposal problems in Brevard County. The $75,000 study was completed in six months; the report was presented to the board of county commissioners on July 15, 1971.

The joint venture group considered thirteen possible solid waste processing and disposal procedures. They weighed each alternative according to environmental impact, functional efficiency, and economic feasibility. The thirteen alternatives are listed below in order of preference:

1. Shredding and milling
2. Conventional incineration
3. Incineration with heat recovery
4. Pyrolysis
5. Slagging and incineration
6. Fluidized bed incineration
7. Total resource recovery
8. Wet fiber extraction with fluid bed incineration
9. Compaction and baling
10. Sanitary landfill
11. Composting
12. Ocean disposal
13. Open dumping

The study group suggested that Brevard County establish a primary, centrally-located disposal facility with transfer stations located in both the north and south. It recommended truck haul, rather than rail or barge haul, for its economy. The central disposal facility would be a shredding and milling operation, capable of shredding 75 tons per hour of unsorted municipal refuse, including major applicances. This would be the first known use in the United States of this type of facility for unsorted municipal refuse. (In the past, such large machines have been used only for shredding automobiles.) Ferrous metals would be separated magnetically for sale to metal processors. An effort would be made to establish markets for ferrous metals as well as for paper products and other salvagable material. The remaining shredded refuse would then be deposited on top of the ground, on an impervious membrane and leachate would be returned to a central treatment facility. Transfer stations would utilize standard push pits and compression packing of 65 cubic yard transfer trailers.

The board of county commissioners accepted the results of the joint venture study team and gave authorization to proceed with the final design.

Financing

Brevard had, as of 1970, countywide bonded debt outstanding of $14 million and special tax school district indebtedness of $31 million. Debt is rated Baa. Tax collections in 1970 were $30 million, with an assessed valuation of $215 million.

Brevard officials contacted William R. Hough & Co., which has served in the past as its financial advisor. Hough then prepared preliminary material for a bond resolution and offering circular, which included costs totalling $6,770,000.

The issuance of revenue bonds in this amount was approved by the board of county commissioners in 1972. Hough & Co., wishing to maintain its role in the local environmental activity, recommended a negotiated placement at 7 percent, with itself as underwriter, even though the bonds were backed by the county's authority to use any non *ad valorem* revenues, to enforce site use, and to set rates high enough to cover bond payments.

Here it must be pointed out that it is customary for the financial advisor to receive a fee if he does not win the bond bidding. If, on the other hand, he should win the bid as underwriter his advisory fee is incorporated into his gross revenue from that underwriting. A number of Brevard's officials felt that Hough & Co. should perhaps not serve as both financial advisor and potential underwriter and that the issue should be open for competitive bids. They also considered 7 percent too high a rate. Contacts with several other investment bankers confirmed their opinions.

When the county asked its financial advisor whether or not it could have its issue incorporated into Florida's AA-rated (5 to 5-1/2 percent) pollution control bond issue, Hough advised that it would not qualify. To procure an unbiased judgment on the matter, the county then applied to the state, and was duly qualified for the issue. Hough & Co. then stated that in its opinion the delays involved in state financing would be a serious disadvantage to Brevard County.

At present, Brevard is awaiting the issuance of the first state of Florida pollution control bonds and subsequent receipt of their share of the proceeds. Should delays prove unacceptable, Brevard County is prepared to go to the market for competitive bids on its revenue bond issue.

In the interim, the county has received a $250,000 solid waste demonstration and resource recovery system grant from the EPA. These funds, together with $318,000 of projected landfill-user fees, will reduce the required bond amount. The EPA grant was awarded, in part, to encourage the county to set equitable landfill-user fees and collection charges. Bids were taken several months ago on shredders and the county chose a 75-ton per hour Williams Shredder. Specifications for the shredder and crane equipment were needed so that the consulting engineers (employed as part of the bond resolution) could design buildings of an appropriate size. Engineering and financing delays have now pushed the projected completion date for the system from late 1973 to mid-1974.

County officials believe that the use of federal funding raised construction costs about 15 percent, since there were prolonged delays in receipt of funds by construction contractors. Since the Federal Government is known for its delays in payment, contractors usually raise their prices on Federally funded construction.

Observations

This case illustrates a possible conflict of interest when one firm serves as both financial advisor and underwriter. In Brevard County, alert and conscientious solid waste officials were concerned about the issue and chose not to accept what they considered biased advise.

Broward County, Florida

Located on Florida's lower east coast between Dade and Palm Beach Counties, Broward County boasts one of the highest growth rates in the nation. Its current population is over 620,000.

Broward County's solid waste disposal problem is not unique. While the volume of wastes is rapidly increasing, current disposal methods principally have either reached their capacity or else are threatened with shutdown because they violate air pollution standards. Broward County's situation is further complicated by the high water table, which precludes the landfilling of unprocessed putrescible wastes.

This is an example of a strong local government determined to maintain an active role in solid waste management.

Solid Waste System Background

As in many Southern states, the county enjoys strong local government. In the area of solid waste management, the county has responsibility for all the unincorporated towns and, more recently, for some of the incorporated towns that no longer wish to manage their own solid waste sector.

The permit district is the unit for solid waste collection in Broward. Private collectors bid for exclusive permits to collect residential refuse in the eight different districts. Permit holders also service commercial and industrial establishments, but not on an exclusive basis. The county sets the residential rates, but the commercial and industrial prices are determined by competition among the permit holders. All refuse is deposited in two county-owned and operated incinerators, a northern and a southern facility, and a privately-owned and operated shredding operation. Each collector pays a flat $5 per ton dumping charge.

The county's northern incinerator has just been modified to increase its capacity from 300 tons per day to 500 tons per day. The southern incinerator currently disposes of 300 tons per day. The shredder owned and operated by Waste Management Inc. has been working almost to its capacity of 500 tons per day.

Recent Developments

Broward County must decide what to do with two incinerators which currently violate the air pollution standards, yet which are working at capacity.

Two factors severely limit the alternatives: environmental acceptability and time. Broward's high water table unquestionably prohibits landfills without extensive precautions. At the same time, air pollution standards are being enforced, and the Florida legislation requires that violating incinerators be closed by January, 1974.

Capacity for at least 500 tons per day is needed till that time, yet within the remaining months, it seems impossible to engineer and build an addition to the existing incinerators, even if the air pollution problems could be solved.

Financing

Both of the original incinerators cost $3.13 million. The 200 ton per day addition to the northern incinerator cost $2.6 million.

Revenue bonds financed the county's two incinerators as well as the capacity-addition to the northern facility. According to plan operating costs and debt service should be met by disposal fees. However, the $5 per ton rate does not cover the operating cost of the incinerator. Since the bond contracts require the county to subsidize any deficit from general revenues, Broward's annual contribution has sometimes exceeded $200,000.

Design and construction of Waste Management Inc.'s shredding operation cost just over $500 thousand and was financed by the firm's internal cash flow.

In looking at its solid waste problems, Broward County has decided that shredding and landfill are the only environmentally acceptable disposal methods that could be implemented within the time constraint. There are then two ways to implement the system. The county either may build and operate the system itself, or it may select a private firm to build and operate it.

A number of firms have already made proposals. Waste Management, Inc. proposes to add to its existing facility at no capital cost to the county. The present $5 per ton dumping fee would also be maintained. Other private firms have made proposals to build and operate the shredding operation on the existing incinerator site at no capital cost to the county.

The county is also evaluating its own designs. These indicate that a system with the needed capacity, built within the allotted time, would cost about $1.2 million.

The county currently favors owning and operating its own facilities. There are a number of reasons for leaning away from the private sector. For one thing, legal covenants contained in its two outstanding revenue bond issues preclude granting of any franchise, license or permit for an operation competitive with its own Waste Disposal System.

There is good reason for this covenant. Since the refuse is collected by private operators, and since the dumping fees are the same regardless of the facility, the collector chooses a disposal site because of its location. If a private company is allowed to build a facility that is more convenient than the county's, the county will lose revenues needed to pay off the bond.

In fact, Waste Management, Inc. is presently operating a system in apparent violation of the covenant. According to the commissioners, this situation has not caused any problems yet because the volume of solid wastes has been growing more rapidly than predicted. Therefore, the company's system has not reduced revenues enough to affect bond repayment. This would not be the case with the new facility because it would be used to replace incinerator capacity.

As of early February, the county had not identified the source of funds to build the system. Their options are limited. It would be difficult to sell a revenue bond in addition to existing revenue bonds that are tied to an incinerator that has to be closed. General county revenues are, by law, required to be used only for projects that benefit the whole county--not just one segment. Straight bank loans are being evaluated, but the feeling is that there is little hope of securing adequate financing in this manner. Thus, in the end, the lack of available capital may force Broward to turn to the private sector.

Observations

Traditional public-private sector conflicts over reliability and control also enter Broward's case. The impending lay-off of personnel who now operate the incinerator is yet another factor.

Although Broward County represents only one example, it is significant to note its determination to build and operate a facility despite the existence of a local firm with a reliable record of performance which currently operates a similar system.

DeKalb County, Georgia

DeKalb County is situated in north central Georgia and overlaps the Atlanta metropolitan area. It currently has a population of 414,000 and this is expected to increase annually by 15,000.

DeKalb County was forced to reconsider the economics of incineration following the passage of federal air and water pollution legislation. Fortunately, the county was in a good position to upgrade its system through the use of general obligation bonds. The ease with which these monies were obtained is underscored by the complete change in the application of the funds after the bond issue was passed. In fact, the county reconsidered its alternatives and ultimately settled on a capital expenditure of considerably less magnitude than anticipated.

Solid Waste System Background

Traditionally, the county has collected residential refuse in all except six small municipalities. (These six towns own and operate their own collection trucks.) Before 1971, commercial and industrial refuse was collected by private haulers. At this time, the county assumed total responsibility for all collection services because of continual complaints about the quality of the service. The Sanitation Department currently operates 22 frontloaders, 98 rear loaders, and 33 side loaders.

All disposal facilities have for some time been owned and operated by the county. Until recently, DeKalb has used two facilities to dispose of all of its solid wastes. One is a rotary kiln incinerator built in 1963 for $2,300,000, with a design capacity of 600 tons per day. Air pollution control is achieved through a baffle-wall and water spray system. The other facility is a sanitary landfill known as the Buford Highway Landfill. Together, the two sites currently process approximately 1,330 tons daily.

Recent Developments

In the latter part of the 1960's, DeKalb County was confronted with the need for major capital investment in its solid waste system. Changes in federal air pollution control standards meant that its incinerator was in violation of particulate emission limitations. Furthermore, the dramatic increase in population over the decade had put a severe strain on the processing capacity of existing facilities.

In 1968, an engineering consulting firm[1] was commissioned to examine the entire solid waste system and to propose alternative systems. As a result of this study, the County Department of Sanitation decided to purchase a new landfill site and to enlarge and modify its incinerator.

The county then hired a local firm to design and estimate the cost of incinerator modifications.[2] Estimated costs were: $1,500,000 for a new kiln; and $1,580,000 for air pollution control equipment. In addition, plans called for spending $3,000,000 for the new landfill site and associated equipment.

With these estimates, the Board of County Commissioners went to the voters and asked approval for a $15,200,000 various purpose general obligation bond issue. This was granted in December, 1970. Included in this amount was $6,080,000 for garbage disposal. In the following year, construction bids were opened. The lowest price for modifications to the incinerator came in at $4.6 million, or $1,520,000 above the estimated cost. This price included no guarantees for the adequacy of the proposed air pollution system's ability to meet effluent limitations.

At about this time, the county hired a new director of solid waste. He decided that the county should re-examine the alternatives, in view of the "excessive" bid price. Additional uncertainty over the future direction of air and water pollution control legislation led the department to "moth ball" the incinerator, and to invest in a shredding/ landfill disposal system. This alternative had suddenly become very attractive when the County Health Department decided to allow shredded refuse to go uncovered for a period of up to one year.

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[1] Black and Veatch, Inc. Report on refuse collection and disposal and cost of service for DeKalb County, Georgia. Kansas City, Mo., 1968.

[2] Robert and Company, Atlanta, Georgia, an established and highly regarded consulting engineering firm. The cost of this study was reported to be $84,000. (Engineering study; solid waste disposal, DeKalb County, Georgia, 1970.)

Two companies were selected to supply shredding facilities.[1,2] Suppliers were selected on the basis of past reputation and bid price. The plants were expected to go on line December 14, 1972. Following a testing and break-in period for the new equipment, the incinerator will be closed in May of 1973.

The new systems will have a combined rated capacity of 125 tons per hour of operation. With the purchase of a new 55-acre fill site, it is expected to meet the needs of the community until 1976.[3] During that time, it is anticipated that new sites will be purchased.

The total cost of the two shredding plants will be $921,000. In addition, $281,000 is being spent on transfer station equipment, bringing the equipment expenditure to $1,202,000. The remainder of the capital funds will be used to cover: (1) building and site preparation costs at the shredding plants; (2) construction of a transfer station at the old incinerator; (3) purchase and preparation of the new landfill site; and (4) miscellaneous equipment needed to upgrade general sanitation department services.

Since construction was not completed at the time of the interview, total system capital costs, as well as steady state operating costs, are unknown.

Financing

Annually, each county operating department submits a capital and an operating budget request to the Board of Commissioners. After the Board negotiates specific budget line items with each department, it determines the amount of monies needed for the capital improvements to be debt financed. This determination is made on the basis of projected tax revenues for the coming fiscal year.

In the past, all capital, except that used for water and sewage treatment plants, has been raised by general

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[1] The Heil Company and Eidal International Corp.

[2] Officials felt that having two companies would create the competition necessary to insure optimum performance.

[3] The plants themselves are expected to last 30 years.

obligation bonds. As of September 1970, the debt capacity of the county was $100,066,243.[1] Net bonded general obligation debt outstanding prior to the $15.2 million issue was $26,962,000, representing a 2.18 percent ratio of net bonded debt to assessed value, or $67.41 of debt per capita. These bonds have been rates A-1.

The county has usually issued general obligation bonds on an as-needed basis, and has included many capital improvement projects in one issue. Furthermore, these "various purpose" issues often do not specify the use to which the funds will be applied. This was the case with the December 1970 issue.

Operating revenues are primarily derived from user charges and contributions from the general fund.[2] During 1970, user charge income accounted for 83 percent of total operating revenues ($5,465,000), while the general fund contribution was 13 percent. User charge rates during 1971 were: (1) $34.38 per household per year;[3] and (2) $.90 per cubic yard for commercial service.[4]

In the past few years, new department management has established a depreciation (sinking) fund intended to finance all collection truck replacements. Trucks are currently depreciated over a five-year life.

Observations

Faced with the need to enlarge the capacity of the solid waste system and to conform to new operating requirements, DeKalb County appears to have made a reasonably cost effective decision. Doubts over the real costs of adequate air pollution control equipment seem well founded, given the experience in other geographical areas. Furthermore, it is probable that the new system will have a lower capital cost per ton of capacity and perhaps also a lower operating cost per ton than the originally intended system.

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[1] The constitutional debt limit is 7 percent of assessed valuation of property, subject to ad valorem taxes. Assessed valuation is 40 percent of estimated actual property value.

[2] General fund contributions are used to subsidize operating deficits. Political approval for user charge increases has been extremely difficult.

[3] Residential service is twice-a-week, backyard pickup.

[4] At these rates, commercial revenues are partially subsidizing the cost of residential service.

What is not clear is whether or not needed incinerator modifications might have been made at an acceptable cost. Nor is it apparent that the shredding-landfill system will have a lower overall annual cost per processed ton than other alternatives.[1]

Departmental management has demonstrated a strong sense of responsibility towards developing a system within the confines of the dollar amount approved by the voters in 1970. In addition, the chosen system should allow for considerable flexibility should legislation, or the economics of the alternatives, change.

Finally, given the typical format of the issues used to generate debt capital in DeKalb County, the relative ease with which capital is raised for solid waste disposal must be viewed in the general context of all county capital financing needs. With a substantial general obligation debt capacity reserve, and an A-1 bond rating, it is likely that DeKalb County will not have any problems in raising solid waste capital.

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[1] For instance, it was apparent from the interview that material recycling had been ruled out because it was not considered competitive cost-wise.

Orange County, Florida

Orange County has a population of 344,000. Centrally-located Orlando is the county seat and largest city, with a population of 99,000.

Orange County's experience in establishing a regional solid waste system illustrates the kind of problems that may occur when a disposal system is upgraded. Specifically, the problems included inaccurate pro forma calculations, failure to ensure total countywide participation, and insufficient attention to the critical evaluation of financing alternatives.

Solid Waste System Background

Before 1970, the county solid waste system consisted of a series of county-owned landfills and open dumps (often burning). The city of Orlando maintains one city-owned landfill and two city-owned incinerators. One incinerator has never been opened because of engineering difficulties. (The case is now in the courts.) The other incinerator is very old. Although the city of Orlando maintains its own disposal system, garbage and items that are difficult to dispose of are often brought to Orange County landfills. Charging only for disposal of garbage, the county landfills and dumps were cared for by nominally paid "caretakers," who had salvage rights. While no county equipment was supposed to be used in salvage operations, this rule was not always observed. At least one caretaker realized large profits from salvage activity.

Recent Developments

In 1967, the Orange County Planning Board began to prepare a series of proposals for improved solid waste management. They were prompted by a growing concern for the environment and expending population. They also knew that the county could not operate open burning dumps indefinitely.[1]

Up until this time, most county landfills had been clay pits resulting from road construction. The 1967 study gave the county an increased awareness of solid waste disposal problems. One result was an increase in the charge for dumping garbage at county sites, from $.10 per cubic yard to $.40 per cubic yard.

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[1] Florida state law now prohibits open burning.

In 1968, the Orange County Planning Department presented a new proposal for countywide solid waste disposal. This $1,700,000 plan included five transfer stations and a landfill, serving the needs of the entire county. The projections upon which the Orange County Planning Department based its estimates of future operating expenses and revenues included a 1970 population figure of 408,000 people, generating 1,233,000 cubic yards of solid waste annually. In 1963, that solid waste volume had been 865,000 cubic yards. Volume was expected to increase to 1,900,000 cubic yards by 1990.

Projected gross revenues were based on a $.32 per cubic yard landfill charge, plus additional fees of $.32 to $.41 for transfer station drop-off. These charges would be levied for trash as well as garbage. The pro forma statements projected a net revenue in each future year large enough to cover debt service completely, and to provide cash flow for reserves and a sinking fund as well. The total capital budget was considered adequate, but with no room for contingencies. The estimated capital budget for the main landfill site was prepared on the basis of discussions with realtors and land owners. Estimates for tractors, trailers, and hoppers were based on preliminary figures obtained from equipment manufacturers.

Each transfer station was to have a ramp and enclosures where refuse would be dumped into a large bulk transport trailer. Material would then be compacted and hauled to the main disposal site. The bulk transport trailers were to have a capacity of approximately 75 cubic yards and would provide a much more economical method of hauling waste than the conventional 20-yard packer truck. The fees at each of the transfer points would be adjusted to cover the cost of transfer operations, the bulk haul transportation, and the disposal fee at the main landfill site. Municipal collectors, commercial operators, and private individuals would be allowed to deposit materials at the transfer stations.

The Orange County Board of County Commissioners approved the County Planning Commission's solid waste disposal plan. Next came the search for financing.

Financing

As of 1970, Orange County had county-wide bonded debt of $13,500,000 general obligation and $3,000,000 revenue, excluding special school district debt. The road revenue bonds were rated Baa and the general bonds Aa. Tax revenues were $29 million in 1970.

Although the county discussed financing with several municipal financial consultants, they relied most heavily for advice on the Orlando branch of a national underwriting and municipal financial consulting firm, Stone and Youngberg. The firm recommended a revenue bond at an approximate 6 percent interest cost. Although a true general obligation bond could have been floated at about 50 basis points less yield, such a bond would have required approval by the electorate. The financial consultants and county officials believed that approval would be very difficult to obtain, although no solid waste bonds had ever been voted down. They also believed that the expense of an election and increasing construction costs over time made the revenue issue the better choice. The financial consultants thought that, as a general rule, problems have usually reached a crisis stage before financing is actually sought. This would make time a crucial factor.

The form of the revenue bond proposed, however, was similar to a general obligation issue. Although the principal and interest thereon are secured primarily by a pledge of, and prior lien upon, the gross revenues derived from the operation of the Orange County solid waste disposal system, they are additionally secured by a pledge of whatever other general county revenues may be necessary to meet bond service, with the exception of ad valorem tax revenues.

Before bonds could be issued, it was necessary for the Florida state legislature to pass a special law enabling Orange County to issue revenue bonds for the purpose of financing a solid waste system. Even with this law, all bonds must be validated by a state circuit court at a hearing. At this hearing, testimony is heard from engineers and financial consultants, and the judge renders an opinion. There is then a 30-day appeal period.

Stone and Youngberg, acting as underwriters, presented the county with an offer to purchase the bonds. Before making the offer, the firm had prepared a six-page bond circular describing the prospective issue. The circular was shown to potential customers and almost all the issue was, in fact, placed before Stone and Youngberg bid.

The pro forma operating, capital expenditure, and income figures contained in the circular distributed by Stone and Youngberg came directly from the Orange County Planning Department. The underwriter substantiated only the population figures and the estimated volume of waste per capita. No attempt was made to validate operating projections.

The majority of the 6 percent bonds were issued in October 1969, at about 95 percent par. The remainder of the issue was held for the next year, when the funds would be needed. The county acquired a 1500-acre landfill site in 1969.

The figures in the financial plan proved to be overly optimistic in three areas: usage, operating costs, and charges. The Board of County Commissioners did not, in fact, set charges as high as the bond resolution required.

Usage was lower than anticipated because Orlando chose not to participate in the system, and because population projections were too high (408,000 estimated for 1970 versus an actual 344,000). These factors resulted in a volume of approximately 1 million cubic yards in fiscal 1972 instead of the anticipated 1.3 million cubic yards.

Orlando's decision not to join raised serious issues. Although the bond resolution required that the county, (which is responsible for franchising collection in unincorporated areas) franchise in such a way that there would be no competing disposal mechanism, the city of Orlando did not come under the county's jurisdiction.

Following Orlando's decision, the consulting engineering firm of V.T.N., Inc. updated the Orange County plan to include three county transfer stations and one large county landfill. Orlando's two incinerators and one landfill station were left under the city's jurisdiction. This master plan, approved by the Board of County Commissioners, included two future lakes and a future golf course, as well as facilities for hauling garbage from Orlando should that be required in the future. The main landfill opened five months late, in June, 1971; the first transfer station several months late, in February, 1972.

Cost estimates proved to be far too low. The proceeds from the $1.7 million bond issue will be completely spent on the main landfill, one transfer station, and equipment, instead of being adequate for a second landfill and five transfer stations. Operating costs of $450,000 in 1972, excluding depreciation, appear to match projections, adjusted downward for volume. However, only the landfills had been operating in 1972. A transfer station had only just opened at the end of the year. This suggests that operating costs were not adequately estimated.

Revenues ($325,000 in 1972) have fallen far below the expected $785,000. This is a result of lower-than-anticipated usage and the Board of County Commissioners' failure to set rates as required in the bond resolution. The resolution required that rates be fixed high enough to cover all operating expenses, as well as 25 percent of the bond interest and principal repayment. The county commissioners felt that setting substantially higher rates would make their waste disposal system unacceptable to member communities. As a result of the low revenues, rates were raised in October, 1971, but the increase was not large enough to cover operations.

The effect of the revenue shortfall of \$125,000[1] has been somewhat mitigated by a demonstration grant obtained from the EPA with the help of V.T.N. Inc. The grant is being used for a study of landfilling in high water table areas. Funds amounted to \$200,000 in 1971; and \$150,000 in 1972 and 1973. However. \$90,000 to 95,000 of this grant was used solely for data-gathering in 1972 and 1973, paying for a contract with Florida Technical University for a series of test-monitoring wells.

As a result of their numerous problems, the county was operating only one model landfill, one transfer station, and one old, sometimes burning, dump. Equipment from the highway department was used in February 1973, at nominal cost. The board left the dump open, because it is such a long distance to the nearest facility that transportation costs are extremely high. But the federal government is requiring dump closing as a condition of the demonstration grant.

The city of Orlando maintains its old incinerator at the prison farm, one landfill, and one non-working incinerator.

Although rates were increased in October 1971, revenues still have not proven sufficient to meet operating expenses, and a major rate increase was scheduled for March 1, 1973. One factor leading to the rate increase is that the city of Orlando usually brings difficult-to-handle items to the Orange County landfill rather than its own. Furthermore, when Orlando's incinerator breaks down, all its garbage and refuse is hauled to county facilities.

Even with these additional charges, a further capital inflow of \$800,000 is needed to build the second transfer station. The county's financial consultants believe there will be no problem in issuing a second lien in order to raise the money. They think that only a 50 basis point concession, relative to the first issue, will be necessary, despite the fact that the Orange County facilities have never been self-supporting.

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[1] Revenues of \$325,000; operating expenses of \$450,000

The financial consultants seem unaware that the state of Florida will approve the issuance of bonds for the purpose of improving the environment. Funds from these bonds can be used by the political entities within the state at a favorable interest rate. Since the full faith and credit of the state of Florida would be pledged for such bonds, they could be offered at 100 or more basis points lower than a second lien issue. Orange County does not seem to be considering this option, however. Instead, it is waiting to see what revenue-sharing funds will be available, before going ahead with a second lien bond issue.

Observations

This case shows what happens when crucial factors are not thoroughly evaluated, namely:

a. Ease of financing;

b. The quality of the services performed by the financial consultant or underwriter;

c. The presence or absence of built-in checks on *pro forma* cost and usage figures;

d. The importance of the political process in determining usage rates and fees in response to inadequate revenues.

The ease with which funds can be raised is highlighted by the county's ability to float a second lien at an estimated 50 basis points more yield than the original issue. This is possible in spite of the failure of the project to generate sufficient revenue to cover operating expenses, and despite the failure of the Board of County Commissioners to set the fees required by the bond indenture. Such lack of flotation difficulty results from the issue's semi-general obligation status.

The financial advisor/underwriter performed a service of very limited value, involving conflict of interest and an undisclosed profit. The advisor did not check critical figures, did not examine the possibility of cheaper funding through the state pollution-control bond program, and recommended a negotiated placement with itself as underwriter. Before bidding, the underwriter had eliminated most of the risk by getting commitments from institutional buyers, using the county's own, unreworked, pro formas. This negotiated placement included an undisclosed fee for services rendered.

With no build-in checks on *pro forma* figures, costs were very much understated. The invalid assumption that Orlando would join the system proved critical in estimating revenue. At present, no adequate cost accounting system exists.

The political process proved critical in the county's failure to meet its objectives. City-county friction resulted in Orlando's unwillingness to participate in the system. Moreover, the Board of County Commissioners felt it politically unwise to set rates as high as the bond resolution and county plans required.

Sacramento County, California

Sacramento County contains the city of Sacramento, the capital of California. In 1972, it had an estimated population of 830,000. Sacramento County has employed a "pay-as-you-go" approach to disposal and collection financing. This approach has proved successful over the past seven years and expansion continues to be financed by this method. Moreover, the county is currently building a transfer station that will be financed jointly with a federal government unit--the McClellan Air Force Base.

Solid Waste System Background

For purposes of solid waste disposal, the county has been divided into three parts: the city of Sacramento (population 330,000), the non-city area north of the American River (population 375,000), and the non-city area south of the American River (population 125,000). Until January 1, 1973, the solid waste from each of these areas was handled by separate systems.

Sacramento County generated about 1.8 million tons of solid waste in 1972, of which 51 percent was estimated to be agricultural, 44 percent residential and commercial, and 5 percent industrial. It is estimated that the solid waste pile will increase at about 2 percent per year over the next decade.

Prior to 1973, Sacramento County provided collection of residential refuse to most of the unincorporated area lying north of the American River and to a few selected areas south of the river. This service area includes some 66,000 households.

Once-a-week collection is provided for two 30-gallon containers.

The service area is presently divided into 56 routes. Each route is serviced at least once a week by one truck with two collectors. Each truck has a 25-cubic-yard capacity and carries from seven to ten tons of refuse when fully loaded. The county has 65 trucks and 124 collectors.

In 1970 (prior to the initiation of unlimited curbside service), the county collected and disposed of 66,000 tons of refuse. In 1971, 85,000 tons were collected and disposed of; and in 1972, an estimated 100,000 tons of municipal residential refuse was handled. County residents pay a $3.25 per month household charge for once-a-week collection.

Sacramento County owns and operates a 655-acre sanitary landfill which is expected to last until the end of the century. The landfill operates at a capacity of 1,000 tons per day.

In January 1973, Sacramento County began collection and disposal service to approximately 17,000 more residential accounts located south of the American River. Before 1973, this area was serviced by a private contractor with a weekly collection franchise. The collector would then dispose of the refuse in his 400-acre landfill. Residential collection from this area amounts to about 90,000 tons a year. This waste, and the approximately 85,000 tons a year of commercial waste (which will continue to be collected by the franchisee), is now disposed of at the county landfill.

At the present time, six vendors have a permit to provide commercial collection in the county. Most of this waste is delivered to a transfer station near downtown Sacramento. It is then taken to the Sacramento County landfill after a limited reclamation of ferrous cans and paper.

In addition to the county's activities, the City of Sacramento provides weekly municipal refuse collection service to its residents. The service area contains over 73,000 accounts and includes commercial collections. Tree and grass trimmings are picked up separately by the City Street Maintenance Department. Other refuse must be hauled by the citizen or private commercial collectors to the county landfill.

The city owns and operates a sanitary landfill disposal site within the city limits which is not open to private collectors or the public. The site does not have scales for weighing material, but an estimated 50,000 to 60,000 tons of municipal refuse are disposed here annually (not including tree and grass trimmings). The city expects its present site to be exhausted before 1980. At that time, it will use the county landfill for disposal purposes.

Recent Developments

Late in 1972, construction began on the county's transfer station in the north area, to service seventeen collection routes and about 60,000 people. It is estimated that the transfer station will be completed and open by June or July 1973. The construction of this transfer station is a joint venture with the McClellan Air Force Base, which had previously disposed of its 50-75 tons per day at its own facility.

The capital cost of construction for the transfer station (including hauling vehicles) will be about $968,000. McClellan will contribute $163,000. The county will finance the remaining $805,000. Operating costs of $300,000 per year are estimated and will be covered by user charges, paid at the facility by private and county collectors.

In addition, the county is studying the feasibility of constructing another transfer station in the south area. It is also considering several material recovery alternatives, to supplement the ferrous can reclamation provided by the city of Sacramento.

Financing

The county's solid waste operations began with the completion of construction of its landfill in July, 1967. The county entered the refuse collection business on April 8, 1968, when a private contractor failed to provide the service. At this time a special Refuse Enterprise Fund was established to include both collection and disposal activities. Disposal activities had been previously financed through the general county budget. Since 1968, the county's entire solid waste activity has been treated as an autonomous financial unit.

Since the inception of its solid waste operations, the county has used the pay-as-you-go method to finance capital requirements. This method makes use of appropriations from the County Service Fund (financed by property taxes) to supplement operating profits and depreciation reserves from the refuse collection and disposal enterprise itself.

Operating income for the Enterprise is generated by user fees for residential collection ($3.25 per month), residential disposal ($1.00 per load), and commercial disposal ($1.25 per ton). The total cost per ton of collection and disposal, including depreciation of equipment and other fixed assets, is passed on to users through service charges on their monthly general tax bill. These unit fees are reviewed from time to time to reflect labor increases, inflation, and additional services provided, and will probably be increased again in 1973.

The county has rejected long-term debt as a financing alternative chiefly because it places a high interest burden on the user, and because of the difficulty of passing bond issues in California. A two-thirds majority of voters is required to support a general obligation bond. Furthermore, the capital outlay in any single year has never been so large that it could not be financed by a combination of user fees and annual appropriations from the general fund. The $618,000 cost for the county landfill was completely financed through appropriations from the county general fund.

For the 1972-1973 fiscal year, an estimated $1,227,000 in capital expenditures was required. Of this amount, $805,000 was the county's share of the north area transfer station and trucks and equipment. (Service charge for this facility will be $5.00 per ton for commercial collectors.) An additional $395,000 was needed for sixteen refuse collection vehicles required by the growth of the service area north of the American River, and by the takeover of collection responsibilities south of the river on January 1, 1973. Finally, $27,000 was required for miscellaneous fixed assets. Of the $1,227,000 required, $257,000 was supplied from previously accumulated operating profits. An additional $247,000 was provided by previous equipment replacement reserves, and the remaining $721,000 was provided by transfer from the County Unincorporated Area Service Fund (property taxes from areas which use the service) which, in essence, is a general fund for services provided to unincorporated areas adjacent to the county.

Observations

Sacramento's approach of user-charges to cover estimated operating costs of collection and disposal seems to be equitable and practical. It is interesting to note, however, that six years after inception, 60 percent of 1973's requirements are being provided by property taxes rather than user-charges. Operating income surpluses will probably never cover the entire capital requirements, and property tax appropriations will continue to be required from time to time. The county has evaluated the merits of bond financing versus higher, short-term taxes through pay-as-you-go financing and feels that the latter is preferable due to the difficulty in getting bond financing as needed--the difficulty being the community approval process.

The county's financing requirements over the next five years will probably include amounts for a south area transfer station, additional collection equipment, and materials recovery processing equipment. These requirements will not be major. After 1980, if the city of Sacramento elects to use county collection and disposal facilities, the county will purchase the city's equipment, and possibly an additional transfer station in the city. However, the additional value supplied by city residents should enable the county to lower its operating costs per ton, and additional revenues will, of course, be provided by city residents.

A significant feature of Sacramento's financial decision-making process is that access to capital is much more important than cost of capital. The county would rather raise taxes than pass the interest cost of bonds to users. It has never examined whether pay-as-you-go with tax increases is more or less costly than bond financing.

San Diego County, California

San Diego County in Southwestern California has a population of over 1.5 million. Of this number, 754,000 are served by the city of San Diego's solid waste system, and 721,000 by the San Diego County system.

San Diego County has few present problems in solid waste collection and disposal. Though its solid waste system provides service for a large number of people, landfill sites are readily available at low cost.

Solid Waste System Background

The county provides curbside residential pickup once a week. Commercial collection is on an as-needed basis. All collection is performed by 36 private firms which are licensed annually by the county. The total daily tonnage is approximately 2,500 tons. The private firms that engage in hauling and disposal operate on a user-charge basis for individual customers.

In the back country areas, the county has set up a bin transfer system. The bins provide a central collection point for the small segment of the population that has always dumped its waste. Solid waste is brought to the bins by citizens in east San Diego County. Private haulers maintain, service and empty the bins under contract to the county. This is the only part of the county system that is not operated on a standard user-charge basis.

The county owns and operates all its own disposal sites. At this writing, there are eleven sanitary landfills. The waste collected by private haulers servicing residents, commercial establishments, and bin transfer stations is disposed of in county landfills.

The city of San Diego operates three landfills of its own, but each is almost filled to capacity. It is possible that the city will eventually elect to take part in the county landfill system.

The county and the city appear committed to landfill for the foreseeable future because of its low cost--about $1.70 per ton for disposal--as well as the availability of land.

Recent Developments

Since San Diego County is committed to landfill as the primary means of disposal, it is unlikely that large capital expenditures will be required in the foreseeable future. Recently, EPA granted a $3 million demonstration grant to the county, to be matched by $1 million in county funds, for construction of a 200-ton per day pyrolysis plant. County officials applied for the grant because of a projected energy shortage and they looked on solid waste as a source of energy in the future.

Financing

All solid waste financing has come from general revenues. Following is a breakdown of the 1972-73 capital cost budget for solid waste management.

Automotive Equipment	$194,000
Land Acquisition	430,000
Capital Improvements	59,000
Major Maintenance	7,000
Rents and Leases	6,000
Total	$696,000

In 1972, the county had a bonded debt of $7.9 million, with a little over $1 million due within one year. The legal debt ceiling was $174 million, based on 5 percent of assessed property valuation. Also in 1972, the county levied taxes of approximately $325 million. It is clear from these numbers that the debt capacity of San Diego County greatly exceeds the debt utilized to date, and that solid waste capital expenditures represent a small proportion of total revenues. Finally, since the solid waste system is on a flat rate user-charge basis, billed outside the normal tax collection process, the solid waste operations are self-supporting.

Observations

San Diego County appears to have a smoothly functioning and well-financed solid waste collection and disposal system. The county could well afford a significantly greater investment in solid waste facilities, if that should ever prove necessary. Given the desperate plight of so many other areas, San Diego County is probably unique.

Southeastern Oakland County Incinerator Authority

Michigan

In 1951, fourteen communities in Eastern Michigan's Oakland County joined together to form and incorporate an incinerator authority. The area served by the Authority covers 80 square miles and contains a population of 360,000. By 1995, this figure is expected to reach 500,000.

The Southeastern Oakland County Incinerator Authority is an example of an organizational form created to support the construction and operation of a solid waste disposal system that no one community alone could sustain. The Authority's ability to finance capital equipment with revenue bonds suggests that this type of financing works very efficiently in this type of situation.

Solid Waste System Background

Community cooperation and joint planning for solid waste services was a fact of life in Southeastern Oakland County as early as 1945. Administrators from municipalities in this area were instrumental in securing the adoption of an Act which allowed two or more cities, villages or townships to incorporate an authority for the purpose of collection and/or disposal of garbage and refuse. The Act also gave the Authority power to issue self-liquidating revenue bonds either for acquiring or enlarging solid waste facilities.[1]

In addition, the Act specified that the Authority and a participating municipality could contract for the collection and/or disposal of trash for a period up to thirty years. In this regard, the charges specified in such a contract can be increased by the Authority, if necessary, in order to provide funds to meet its obligations. Further, the Act specifically stated that "the legislative body of each city, village or township which is part of such authority is authorized to raise by tax or pay from its general funds any monies required to be paid by the articles of incorporation or by the terms of any contract between it and the authority."[2] The thirty-year contract privilege and the Act's revenue provisions are features not often available to municipalities that wish to cooperate in providing solid waste services.

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[1] Act 179, Michigan Public Acts of 1947,§123.308 Sec. 8

[2] Ibid.

Following passage of the Act, the fourteen communities spent several years in negotiation and planning. In 1951, the articles of incorporation were finally drafted and adopted for the Southeastern Oakland County Incinerator Authority.

The governing body of the Authority is a board of trustees composed of a representative and an alternate from each municipality. Each is appointed for one year. Each representative on the board has one vote for every 3,000 tons of garbage and rubbish delivered from his or her municipality during the preceding year.

Under the contract currently in force between the Authority and the fourteen municipalities, the amount paid by each community is based on the weight of garbage and trash at the time of delivery to the Authority. Of course, the rate has increased rather steadily as new equipment has been added and operating costs rise. The original rate of $4.25 per ton will have increased to $7.06 per ton in 1973. These rates are designed to produce an excess of revenue over expenses, and have consistently done so.

In addition to the charges based on the weight of refuse delivered to the Authority, each community is required to pay a "Ready-to-Serve-Charge". The amount paid by each city equals $100 per ton for the greatest single average day that city has had in the last five years. Although the revenue from this source amounts to only 6 percent of the Authority's total income, it is approximately 25 percent of the debt service requirements.

The "Ready-to-Serve-Charge" was included in the Authority's rate structure in an attempt to secure greater equity among the member communities. The plan was supposed to provide some funds for making services available to those communities that are growing. In practice, however, the charge does not seem to provide significant revenues. Revenue figures from a recent income statement show that if the "Ready-to-serve-Charge" had been allocated on a refuse-per-ton-delivered basis during the same time period, the additional charge would have varied between $0.43 and $0.54 per ton with an average of $0.44. The range is so small that it is almost meaningless.

Following its incorporation, the Authority acquired a 30 acre tract of land and constructed a 450 ton per day incinerator which went into service in 1954. This original plant contained three batch-fed furnaces. Within six years their capacity became insufficient. The amount of refuse delivered daily to the Authority for disposal increased from an average of 287 tons per day in 1955 to 575 tons per day in 1965. To meet growing needs, the capacity was increased to 600 tons in 1963. The remodeling included the replacement of the three batch-fed furnaces with two continuous-feed, revolving-grate furnaces with water baffle air pollution control and an additional stack.

The Authority also owns 240 acres of a partially-wooded abandoned gravel pit for use as a landfill site. The land was purchased by the Authority with the understanding that when the landfill was completed it would be returned to the township for development as a public park. The Authority's landfill areas, coupled with the incinerator, should be capable of meeting the needs of the Authority through 1995.

Finally, in 1970, the Authority decided that a transfer station would be necessary in order to process and distribute refuse efficiently between the incinerator and the landfill. After more than two years of hearings before city councils, citizens' committees and planning commissions, the Authority purchased a ten-acre centrally-located site. The station utilizes a non-compaction transfer system in a two-level, totally enclosed structure. When operated on an eight hour per day basis, the station can process approximately 600 tons of refuse.

At present, the Authority is receiving an average of 810 tons of refuse per day. This volume is projected to reach more than 1,300 tons per day by 1995.

Recent Developments

The immediate problem confronting the Authority is that the incinerator is not meeting either Michigan or federal air pollution requirements. The Authority determined that the installation of Venturi scrubbers would be required to meet pollution control requirements. This system was recommended and engineered by Dow Engineering Corporation. The cost for the system will be $1.4 million, and construction was scheduled to begin in February 1973.

Financing

An ordinance of the Authority sets a prerequisite for the issuance of revenue bonds. Average net revenue (total revenue less operating expenses) for the preceding two operating years must be at least 150 percent of the maximum amount of principal and interest maturing in any operating year, on all bonds of equal standing, including any additional bonds proposed to be issued. The funds remaining after meeting yearly principal and interest payments are divided between a general reserve fund and an ongoing capital improvement program. For example, the fiscal 1973 budget projects that more than $250,000 will be available for division between the reserve fund and the capital improvement program.

Five separate revenue bonds have been issued within the past nine years:

- 1954 - $4.25 million for incinerator plant
- 1962 - $2.35 million for capacity increase to 600 tons per day
- 1969 - $455,000 for ash conveyor and for refunding original issue
- 1970 - $1.5 million for transfer station
- 1973 - $1.4 million for pollution control equipment.

The Authority has established a good record of bond financing and repayment. For this reason the financial advisor handling the current bond issue expects an A or A-1 rating and a trouble-free underwriting.

All municipal bonds in Michigan must be cleared by the State Municipal Finance Commission. This three-member board has the responsibility of providing both a technical and financial review of any proposed project.

All municipal bonds in Michigan must also be offered for competitive bidding. This does not seem to create a problem, even for smaller issues, since there is a large number of regional investment banking houses in nearby Detroit.

The following is a schedule of events for the Authority's Air Pollution Control Project:[2]

October 18, 1972 - Publish intent to issue bonds

October 31, 1972 - Authority places Legal Aid by this date for construction bids.

November 3, 1972 - Dow delivers bidding documents to the Authority.

November 6, 1972 - Bidding documents delivered to Madison Heights Building Commission and bidding documents available for contractor pickup.

November 21,1972 - Estimated approval of State Municipal Finance Commission

December 1, 1972 - Madison Heights Building Department approval received.

December 20,1972 - Contractors Bids received.

January 10, 1973 - Award Construction Contracts, subject to the Sale of Bonds.

January 23, 1973 - Sale of $1.4 Million Incinerator Series IV Revenue Bonds.

February 5, 1973 - Start Construction.

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2. Southeastern Oakland County Incinerator Authority, "Quarterly Report - October, 1972".

Observations

The Southeastern Oakland County Incinerator Authority was established in order to provide the services of a capital intensive solid waste disposal system to a group of relatively small communities. A primary reason for constructing an incinerator was an anticipated shortage of landfill sites.

Raising reasonable amounts of capital has clearly not been a serious problem for the Authority. The use of revenue bonds for capital formation is dictated principally by the organizational form. Since an authority has no general revenue base, it cannot issue general obligation bonds. For large amounts of long-term funds, it must, therefore, use a form of borrowing that is suited to its structure. The revenue bond is the ideal mechanism.

The Authority has taken advantage of Michigan laws that permit long-term contracts, and allow each municipality to use general revenues to meet its share of the Authority's obligations. It can issue revenue bonds that are more like general obligation bonds than true revenue bonds, where demand conditions alone determine income. Its revenue bonds are, therefore, well accepted in the financial markets. During our interviews, the financial advisor told us that the nature of the Authority had no effect whatsoever on the bond rating or sale price.

In summary, the financing of capital expenditures has been a fairly routine procedure for the Authority. Funds for expansion and improvements have been available as needed.

Ventura County, California

Ventura County, on the central coast of Southern California, has an estimated 1973 population of 430,000. Population forecasts of the California Department of Finance predict a threefold increase to 1.24 million in the next 30 years. This would make Ventura the fastest-growing county in the state. In its decision to adopt a regional approach as the most economic alternative in solid waste management Ventura County is typical of many metropolitan areas with populations in the 350,000 to 500,000 range.

Solid Waste System Background

Solid waste management in Ventura County has passed through several stages during the last decade. The trend has been toward centralization of responsibility in both the planning and operation of disposal facilities.

Before 1970, the county's solid waste disposal requirements were met through the utilization of private landfills, landfills in adjacent counties, and open dumps. In an attempt at combined planning in the county, the Department of Public Works prepared a "General Plan of Refuse Disposal Sites" in December, 1967. The Department attempted to provide a development plan for landfill sites and to meet the growing needs for solid waste disposal facilities. The County Board of Supervisors did not approve the document and, consequently, none of its recommendations were formally implemented.

With the increasing need for new landfills to accommodate the growing refuse disposal requirements of an expanding population, the County Board of Supervisors realized that a countywide approach was mandatory. They formed the Ventura Regional County Sanitation District (VRCSD) on June 28, 1970. The sanitation district's boundaries conformed to county boundaries. A major management goal was the transfer of all county solid waste planning functions and operations to the regional district.

Early in 1971, the County Board of Supervisors formally adopted the concept of public ownership of solid waste disposal facilities. Subsequently, the Board approved the transfer of existing county disposal operations to the district and adopted an ordinance prohibiting operation of a private landfill in the unincorporated area. The actual transfer of facilities took place July 1, 1972.

The District Board of Directors is composed of the mayors of the nine cities within Ventura County, the chairmen of ten special sewage collection districts, and the chairman of the County Board of Supervisors (representing the unincorporated areas of the county). The county's equipment and personnel were transferred to the regional district.

Currently the VRCSD operates three sanitary landfills with a total capacity of 750 tons daily and two non-commercial transfer stations to service residents distant from the landfills. The major disposal site in the county, however, is the Ventura Coastal Landfill, a privately owned and operated facility with a capacity of 600-800 tons per day. Finally, about 150 tons per day are exported to Los Angeles County landfills. In total, 1,200-1,400 tons per day are handled by all facilities. Sixty-five percent of collected refuse is from residential sources.

All of VRCSD's refuse disposal sites are leased from private owners. Most of the existing disposal site equipment was taken over from the county by VRCSD on July 1, 1972. New equipment has been acquired by the district on lease-purchase arrangements. User fees for disposal are charged by two of the landfills. Other facilities do not charge the public directly. Fees range from $1.50 to $2.00 per ton, but do not cover operating expenses. The deficit in operations and capital expenses has been covered by the county's general fund.

The Regional District is not authorized to enter the collection business. Collection of household and commercial waste is handled by a variety of methods--municipal systems, competitive commercial firms (individual homeowner contract), franchise operations, and restricted contractors. About 70 percent of all collection is private. Monthly residential rates range from $1.75 to $3.00, and are generally higher than in other nearby counties. Combined refuse collection is carried on in every city, with collection frequencies of once or twice per week.

The volume of municipal waste generated in the district has not warranted the use of processing systems such as pyrolysis. Landfill costs are considerably lower. Recycling is practiced on a small scale by local community groups.

The entire range of activities of VRCSD is summaried in its "Regional Solid Waste Management Plan," prepared in May, 1972.

Recent Developments

VRCSD must locate an economical, centrally located landfill as an alternative to the major one in operation, the Venture Coastal Site. A prohibition on private landfills adopted by the County Board of Supervisors will terminate operations at the privately owned Ventura site within the next few years. Even if this prohibition had not been passed, VRCSD would still face the task, for this site currently handles nearly two-thirds of the district's wastes, and has only a two-to-five year additional capacity. In addition, the district needs a site for the disposal of toxic and hazardous wastes.

VRCSD studied several possible sites and finally located a desirable one at Lake Canyon in Ventura. The city agreed to acquire the land and provide it for VRCSD (under a Joint Powers Agreement), with VRCSD paying the city a user charge based on yards filled. During and following landfill operation, ownership would remain with the city of Ventura, and the site would eventually be converted into a regional park.

VRCSD agreed to absorb the estimated $500,000 for site improvements: extension of an existing access road, installation of scale facilities and of water and power facilities, construction of drainage systems, addition of fencing, and acquisition of necessary environmental monitoring equipment.

An estimated $400,000 to $500,000 will also be needed for equipment. Finally, about $150,000-$200,000 is required to assist VRCSD in planning and initiating preparation and construction efforts.

Financing

VRCSD felt that user charges and the existing general tax would cover operating costs of the new landfill, but that "front money" was required to finance site development and acquisition of equipment. Eventually, the district hopes to finance disposal entirely with user fees. With a planned $80,000 coming from the district, VRCSD applied to the EPA for a solid waste demonstration grant of $240,000 for a model sanitary landfill. Only $40,000 for planning and management was received from the EPA. So the district is looking for alternative financing possibilities to pay for construction.

District officials believe that traditional sources of property taxes or bonding are not feasible. California Senate Bill No. 90 puts a freeze on the tax rates of special districts, the easiest source of revenue for VRCSD. General obligation bonds require a two-thirds majority in a public election. District management feels that the likelihood of approval of solid waste general obligation or revenue bonds by Ventura County voters is slight.

District managers believe their best chance for financing rests with revenue-sharing, and they are now attempting to negotiate funds. The District is also attempting to increase user charges for the existing and proposed landfills. However, a sizable increase may lead people to resort to illegal dumping (in part because most of the county's disposal facilities did not charge the public directly for many years).

Observations

In Ventura County a regional solid waste management district has been established with the authority to implement an area-wide disposal plan. Federal and local funds have been used to make planning studies and to establish a centrally-located Class I landfill site. The site has been tentatively secured, and district officials believe that zoning will be approved. However, funds are lacking for site development and equipment acquisition.

Traditional sources such as bonds and local taxes do not appear feasible to district management. A federal construction grant has been denied, and government loans are unavailable. Revenue-sharing appears to be the only hope, but district officials are unsure whether sufficient funds can be generated from this source, and when they might be available. Probably, a combination of increased user charges, increased district ad valorem taxes, and revenue-sharing will provide the fund requirements of the district over the next five years.

Weber County, Utah

Weber County, located in the Salt Lake Valley, has a population of 120,000.

Weber County provides an example of a financing strategy for an already efficient and economical incinerator facility. More than half of the required capital is being provided by the Defense Supply Agency's Defense Depot at Ogden, and the remainder, by revenue sharing.

Solid Waste System Background

In the mid-1960's Weber County considered several possible landfill sites to dispose of its rapidly expanding solid wastes. Many were unusable because of the high water table from the Great Salt Lake. Others were too remote. The county also considered composting but found this unfeasible. Next, two systems of incineration were investigated. The first, a large-scale incinerator, with a 500 ton per day capacity, was estimated to cost $1.5 million. The second, a smaller facility with a 300 ton capacity, was estimated to cost about $500,000. Weber County chose the latter.

Clear Air Solid Waste Reduction, Inc. completed the incinerator in December, 1966, at a cost of $487,000--all of which was financed by property taxes from the 1966 and 1967 county general fund. (No bonding was required.) The incinerator receives municipal and private collections of residential, commercial, and industrial solid wastes for the entire lower valley area of the county. The incinerator site is only 1.4 miles from the county's population center, and the average haul distance is approximately four miles. Adjacent to the plant is a 100-acre residue and fly ash disposal site, which has an estimated life expectancy, at current usage rates, of approximately 200 years.

The incinerator's two 150-ton furnaces are continually charged by conveyors fed by front-end loaders from a surface storage area. It averages 91 percent reduction in volume, and 61 percent in weight. It also reduces combustibles 98 percent. Air pollution levels are very low.

The cost of operating the incinerator has ranged from $2.45 per ton in 1969 to $2.95 per ton in 1968 on a volume of 45,000 to 70,000 tons per year (250 days at 200-250 tons per day). Amortization costs have been $.60 per ton and interest opportunity costs another $.20 per ton (although no interest is paid because it was not debt-financed). The total cost for a representative year between 1969 and 1972 was about $3.50 per ton. This cost is the lowest of seven incinerators surveyed by the Bureau of Solid Waste Management in 1970.

The county is not involved in collection. Each community, through its own municipal or private pick-up service, delivers directly to the incinerator.

Recent Developments

In 1971, with the two 300 ton furnaces running near capacity, the county decided to build a third furnace for the incinerator complex. This would add another 150 tons per day to capacity. The contract was put up for bidding in August, 1972. In September 1972, Clear Air, Inc., a successor to the original incinerator builder, submitted the lowest bid, $624,000. The third furnace is expected to be in operation by Fall, 1973.

The expansion will enable Weber County to process an estimated 25 tons per day of waste generated by the Defense Depot in Ogden, its principal city. These wastes are currently being burned in an open dump at the Depot, in violation of state air pollution laws. The incinerator will be in full compliance with air pollution laws upon completion of the 150 ton expansion unit.

Financing

All operating expenses for the incinerator have been covered by the county's general fund, and charged back to the communities served, on a population basis ($.50 per household per month). Communities have combined this with collection and landfill charges and have passed them on to residents usually as a refuse charge on their general tax bill.

The Defense Depot has agreed to pay $365,000 of the $624,000 cost of the incinerator expansion. The remaining $259,000 of the cost will be financed from Weber County's revenue-sharing allocation. (Preliminary indications are that the county will receive $782,000 in revenue-sharing funds, and the County Commission Chairman has earmarked $259,000 for the incinerator project.) No property tax or general fund money is expected to be used for construction. Traditionally, Weber County has financed new projects through current funds, rather than debt.

Observations

The Weber County incinerator appears to be one of the most economical and efficient solid waste facilities in the country. The facility is, and will continue to be, in complete compliance with air pollution standards. Capital costs for both the original 300-ton incinerator and the 150-ton expansion are very low.

The county's use of property taxes to finance the original installation is unique among methods for funding incinerators. By providing the Defense Depot in Ogden with economies of disposal, the county was able to raise $365,000 of the $624,000 required for the 150-ton expansion. The use of revenue-sharing funds for the remaining $259,000 appears the easiest way for Weber County to complete the financing.

Colorado

The Rocky Mountain State of Colorado has a population of approximately 2.21 million widely dispersed among several large cities and hundreds of smaller towns. By 1980, the population is expected to increase by about 25 percent. Demographers predict a population of 3.75 million by the year 2000.

In the area of solid waste management, Colorado does not pursue a program of vigorous involvement in local affairs. Rather than extending financial aid, the state provides training and planning on a regional basis to counties, cities, and towns throughout the state. Although there are twelve planning regions, the basic unit in solid waste management is the county.

Solid Waste System Background

About 61 percent of Colorado's 298 landfill sites are open dumps rather than sanitary facilities. The remaining sites reportedly need upgrading. There are no municipal incinerators in use. Little financing of solid waste disposal equipment has occurred in the state. One city, Alamosa, with a population of 8,000, recently obtained a 15-ton per hour grinder to process solid waste prior to landfilling. No cost data on this has been released. Denver recently established a transfer station to service a landfill located 25 miles outside the city but soon closed it because private sites nearby offered a more economical alternative.

The principal state agency concerned with solid waste management is the Colorado Department of Health which provides technical advice and services to other governmental entities, private organizations and individuals. Its rules and regulations are set by the State Board of Health.

Public land is an important source for potential landfills and approximately 70 percent of the sites in the state lie on land owned by some public agency. About 36 percent of the land area of Colorado is owned by the Federal Government and is under the control of the Forest Service and the Bureau of Land Management. About 85 percent of the sites are operated by public agencies.

A 1968 solid waste survey conducted by the State Health Department, in cooperation with the Public Health Service, found that wastes collected amount to a daily average of 5.3 pounds per capita. This amount is expected to increase by 1990 to 12.3 pounds.

For the 1968 survey, data was compiled on storage, collection, and transportation practices in local communities. Weekly collection is provided for most household refuse. Survey findings indicate the annual cost per capita for household collection ranged from $3.76 to $9.55, with an average of $7.30. In communities of more than 5,000, 54 percent of the population is served by publicly-operated collection systems; the rest, by private collectors. Total costs per capita per year for solid waste disposal sites and facilities was $.60, compared with a national figure of $1.70.

In accordance with state statutes, Colorado cities and towns have authority to regulate trash collection. Disposal districts, for collection and disposal of solid wastes, may be formed in counties which maintain a county or district health department. None have yet been formed, however.

County planning in the solid waste field is directed largely toward disposal matter, as only one Denver City/County has concerned itself specifically with collection. Collection has been handled by towns, cities, private haulers, and individuals. The Solid Waste Disposal Act of 1967 authorizes the boards of county commissioners to issue licenses to public and private operators of disposal sites and facilities.

In other words it is expected almost to double the increase projected for population. Using a generation rate of only 6.5 pounds per capita per day, it was estimated that an annual acreage in disposal sites would amount to approximately 1,500 acres in 1990, if the waste were disposed of in five-foot lifts.

Recent Developments

There are two Regional Councils of Governments in Colorado, one in Denver and one in Colorado Springs. The Denver Regional Council of Governments is a voluntary association of elected officials from local governments and political subdivisions within the five-county Denver metropolitan region.

In March 1968 the Denver Regional Council formed the Solid Waste Technical Advisory Committee to conduct solid waste management studies and investigations for the Denver Metropolitan Region. In August 1972, a comprehensive solid waste management plan for the region was prepared under a project entitled "REUSE". Two thirds of the $300,000 funding for this project was contributed by a Federal Grant from the Housing and Urban Development Agency.

The Pikes Peak Council of Governments represents the city of Colorado Springs and surrounding political entities. It functions in a manner similar to the Denver Regional Council but has not yet prepared plans for solid waste.

On May 22, 1972 the Governor of Colorado signed into law the Service Authority Act (SAA) which authorizes the establishment of service authorities in a variety of areas: solid waste, water control, public surface transportation, flood control, cultural facilities.

Formation of a service authority may be initiated in two ways:

1. a petition signed by qualified electors within the jurisdiction of the proposed authority, numbering not less than 5 percent of the total number of votes cast for all gubernatorial candidates in the preceding election; or

2. a resolution adopted by the majority of the governing bodies of the municipalities and counties in the area.

A service authority is governed by a board of directors, whose size is determined by the population of the area. Members of the board are elected at the November general election, and serve for four-year overlapping terms. Whatever corporate and governmental powers are necessary for the effective delivery of services are granted to the board.

Financing

Colorado has not used general obligation bonds to finance any of its needs since 1951. Since 1936, revenue bonds, or warrants, have been issued from time to time for highways, state colleges and universities, and state homes for the aged. These are paid for by user fees, such as tolls and dormitory room rentals. In 1969, cities and towns had outstanding bonds of special improvement districts, general obligation, and revenue bonds of about $596 million.

Solid waste management systems in the state are financed through general funds, collection fees, and disposal site fees. The boards of county commissioners are authorized to levy a tax, not to exceed one-half mill, for financing district expenses including solid waste management. County commissioners can also appropriate money out of the general fund for maintaining landfills.

A wide range of fiscal resources open to the service authorities includes ad valorem taxes, service charges and fees, and any intergovernmental grants that become available. The authorities will also receive a portion of any state-collected, locally-shared taxes that may be established in the future. Provisions for the use of special taxing districts are designed to assure that assessments and charges for services are paid only by those residents of a service authority to whome the services are made available.

The boards are also authorized to issue revenue and general obligation bonds for the acquisition, construction, installation, and completion of improvements or facilities. Any indebtedness of this type requires approval of the voters.

Idaho

The far western state of Idaho has a population of 713,000[1].

Idaho has no comprehensive, statewide solid waste management program, although plans are in the formative stage. It is highly unlikely that state funds will be available to local or regional governments for implementation of a solid waste management program. The financing burden will remain with the individual communities.

Solid Waste System Background

The entire range of collection methods is represented in Idaho. Only 40 to 50 percent of the population is served by organized collection services. According to a 1968 survey, Idaho had 271 refuse disposal sites, of which only seven could be termed "sanitary landfills." The average cost per person per year for refuse disposal was approximately $.50.

In 1970, the Idaho Department of Health prepared a status report and a state plan, aimed at correcting inadequacies in the present system. Two bills were passed by the Idaho State Legislature in that year: one which gives the State Board of Health power to enforce statewide standards; and another which permits counties to become financially and practically involved in solid waste management.

Recent Developments

Since the 1968 survey, several disposal sites have been closed. It is estimated that no more than 211 sites are currently used. The Environmental Protection and Health Act, passed in 1971, consolidated solid waste activities at the state level under the Environmental Protection Division (EPD) of the Department of Environmental Protection and Health.

According to a state official, the possibility of establishing a system of material recovery is weakened by the structure of the market and the distribution of the population. However, the state is supporting research on the feasibility of recycling. At the same time, five northern counties are evaluating alternative approaches to solid waste management under a short-range planning grant from the EPA.

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[1] U.S. Census, 1970.

The EPD is currently revising regulations and standards for solid waste management. New regulations will result in the closing of all substandard sites (i.e., those with inadequate air and watter pollution controls). To achieve its objective, the EPD plans to use a permit system, and to provide technical assistance to local communities.[1] Financing will remain at the local level.

Financing

As of June 30, 1970, the state's bonded debt was $1,956,000, of which $456,000 was in general obligation bonds, (State Building Bonds). The assessed value of total property was $996,349,000 in 1970. During this same year, the state collected $131,408,640 in taxes. The bulk of this is derived from income taxes ($56.2 million), and a 3 percent sales tax ($41.6 million).

Until January 1, 1973, the state's solid waste program was funded by a planning grant from the U.S. Bureau of Solid Waste Management, on a 50-50 matching basis. A continuation grant, to end June 1974, has been approved by the Bureau, but no one knows how it will be affected by the recent budget cuts in federal solid waste programs.

No state funds will be available for the capital financing of solid waste processing and disposal.[2] Counties now have authority for solid waste management, and also have the power to raise a two mill tax on the assessed value of land, to finance solid waste management.[3] Since this financing mechanism promotes taxing inequities, the state supports the introduction of user-fees at the local level, to meet communities' capital and operating expenses.

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[1] Some cities with special problems will be allowed to operate substandard landfills.

[2] A bill which proposes a statewide junk-auto program is currently in committee for study. A "disposal fee" for each car would give the state the means to run the program.

[3] It is estimated that more than half of the counties already levy this tax.

Observations

The rural nature of Idaho has fostered the development of a number of uncoordinated systems. As a result, the costs of upgrading local processing and disposal systems to meet state standards will be high. Without a state funding program, rural communities will be unable to meet present standards. On the other hand, increasing costs may force communities to accept a regional approach to solid waste management. This would give officials more flexibility in arranging financing.

Vermont

Vermont is comprised of fourteen counties, with a total population of 44,732 distributed over 9,609 square miles.

Vermont has formulated a distinctive approach to solid waste management in that a State Act has made recycling a positive goal in the management of solid wastes.[1]

Solid Waste System Background

An estimated 56 percent of Vermont's population is presently served by organized refuse collection systems. All types of collection service, both municipal and private, are represented in Vermont. Current charges for collection range from $20.00 to $40.00 per ton.

Of the 116 sites currently used for disposal, only a dozen meet sanitary landfill standards, and only 26 percent of the population is now served by these sanitary landfills. This low figure is a result of the dispersed, low density nature of the state's population--the single most important characteristic in determining solid waste management. In 1972, 313,000 tons of Vermont's solid waste was handled in landfills. Today each of the 246 cities and towns in Vermont has responsibility for its own solid waste management.

Recent Developments

The purpose of Vermont's solid waste management and resource recovery plan is to minimize the burden on land through effective resource recovery and the most efficient use of present landfills. It would initiate material recovery through mandatory domestic, commercial, and industrial source separation, and simple processing in regional treatment facilities. It would also consolidate the existing disposal sites into regional sanitary landfills, and establish regional transfer staitons, so that convenient disposal sites would be available to all citizens in the state.

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[1] Act No. 252 of the Acts of 1971.

[2] Each disposal site must be approved by the Environmental Protection Division of the Agency of Environmental Conservation--AEC.

In February 1973, a bill was introduced by the Committee on Natural Resources to the State Senate which would authorize implementation of the Solid Waste Management and Resource Recovery Plan.[1] If the bill is accepted, the state will finance all capital and operating costs of the system, excluding collection. Although operating control and maintenance will remain at the local level, the state will assume all capital risks for development of the system. A solid waste management tax will provide the money needed to finance transfer, material recovery, and disposal operations. The individual citizen will no longer be directly involved through user-charges or yearly fee in the financing of solid waste disposal. Total net expense, that is, total expenditures minus recovery revenues, over the next ten years should reach approximately $20 million.

Financing

As of June 30, 1971, Vermont's bonded indebtedness totaled $203 million. The rating of Vermont's general obligation is Aaa. The total assessed value of property in 1971 was $1.56 billion. Revenues are generated by the state sales tax, which is 3 percent of retail sales, and corporate and personal income taxes. Total revenue during fiscal 1971 was $274,020,592, including a federal grant of more than $82 million.

Vermont uses several financing mechanisms: user charges, yearly disposal fees, and property taxes. If the state maintains its environmentally-aware position, the average price paid by the private individual for disposal of his refuse will more than double by 1975, from $2.45 to $6.00 per person per year.

In 1969, the General Assembly of the State of Vermont created the Municipal Bond Bank as a new financing mechanism.[2] In December 1970, the bank issued $46 million in 1970 Series A Bonds, rated Aa. These bonds are obligations of the Bond Bank rather than of the State of Vermont.

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[1] The plan was prepared by Resource Planning Associates, Inc., management and engineering consultants, Cambridge, Massachusetts.

[2] According to its charter, the Bank would "lend money to counties, municipalities, or public bodies by direct purchase from such governmental units of their bonds, notes, or evidences of debt payable from ad valorem taxation."

The proposal recommended by the Committee on Natural Resources includes a solid waste management tax of $3.00 per $1,000, or 3 mills, on all products sold at the retail level. This tax would generate more than $2 million per year--enough to implement the plan and to defray additional collection costs at the local level.

This bill will not recommend a specific financing method; however, the Committee on Natural Resources is currently considering several financing alternatives. One involves raising the initial capital from the Municipal Bond Bank and repaying these revenue bonds with a 3 or 4 mill solid waste management tax. Another financing method under consideration is to raise the present 4 mill tax on beverage containers to 8 mills. The possible revenue generated by this tax is estimated at $1.6 million per year. At the present time, no specific financing mechanism has been recommended by the Committee on Natural Resources. The committee believes that Vermont's House of Representatives will have to make the final decision on financing.

In 1971, a bill with a dual purpose--reducing Vermont's solid waste pile and generating revenue for solid waste programs--was introduced in the Vermont Legislature. Essentially, the bill prohibited the sale of beer and non-alcoholic beverages in non-returnable containers. Amendments providing for a tax, but no ban, on all non-returnable containers were passed. The final bill, enacted in 1972, specified a 4 mill tax, to be replaced by a deposit charge of 5 cents on returnable containers, and a ban on non-returnable containers effective July 1, 1973. The revenue collected from the beverage container tax has been estimated at $3.2 million per annum, but may be as low as $800,000. The bill states that the first $1 million will be distributed to committees for the operation of "approved" landfills. Funds beyond the first $1 million will be allocated to the Agency for Environmental Conservation, the AEC, for use in establishing recycling centers.[1]

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[1] Distribution of the tax monies to local communities started early in 1973.

Observations

Vermont's approach to solid waste management is unique in several respects. First, the state rejects the proposition that resource recovery is an alternative reserved for densely populated areas. Then, too, reliance on public participation is considered an important factor in the plan's success. Finally, to facilitate adequate funding from the outset of the program, the state has established a special agency, the Municipal Bond Bank, and has shown itself amenable to millages and other forms of taxation. The method of financing is less important than the concept itself.

Washington

The State of Washington has a population of 3.4 million, and demographers estimate an increase to 5 million by 1985. Two factors make Washington's case significant in the area of solid waste management: (1) Three of its largest cities, Seattle,[1] Spokane, and Tacoma, operate solid waste utilities; (2) For the first time in its history, state funds will be available for solid waste facilities.

Solid Waste System Background

Washington's Department of Ecology estimates that the state's total solid waste is more than 30 million tons per year. Agricultural wastes represent more than 50 percent of the total waste. The residential waste stream alone is estimated at 3.4 million tons per year, or 5.5 pounds per person per day.

According to a 1966-67 survey, 74 percent of household wastes, 79 percent of commercial wastes, and 56 percent of industrial wastes are collected by organized services, both municipal and private. Private collectors account for more than 70 percent of this organized collection. The Washington Utilities and Transportation Commission regulates collection in the rural parts of the state. However, cities and towns do not need certification by this commission. In 1967, 97 percent of the 339 land disposal sites in operation were open dumps. The average community budgeted funds for disposal at $1.30 per person per year but the figures ranged from $3.22 to $0.47.

Recent Developments

Solid waste management in Washington, at the state level, started in 1967 with the development of laws regulating solid waste activities. In 1969, the state legislature, with the assistance of a seven-member Solid Waste Advisory Committee, adopted the Solid Waste Management Act. The Act assigned "primary responsibility for adequate solid waste handling to local governments, referring to the State, however, those functions necessary to assure effective programs throughout the State". The legislature appropriated $669,000 to assist local governments in the development of solid waste management plans during the next twenty years.

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[1] Discussed in a separate case.

By June 1973, 37 counties will have completed their plans, and the remaining two are in the process of preparing theirs. Eighteen counties are already in various stages of implementation. Current efforts are aimed at the elimination of open dumps and upgrading of disposal sites. Most counties are planning for centrally located sanitary landfills and transfer stations, and/or drop-off boxes. In November 1972, the minimum functional standards for solid waste handling became effective. Enforcement of these standards is the responsibility of the jurisdictional health department.

The Department of Ecology sponsors training courses and seminars on a wide variety of subjects, such as rural transfer systems, leachate, recycling, grinders and shredders, and hazardous waste. Since the inception of this program in 1971, under a full grant from the EPA, it is estimated that some 4,000 persons have participated in free training programs. The Department of Ecology also provides audio-visual material to interested groups.

The Department of Ecology recently hired a consultant to study the feasibility of rail transfer of all of western Washington's wastes to an existing strip mine operation. In the study, reclamation, energy recovery, and disposal by sanitary landfill methods will be evaluated.

Financing

As of July 1, 1971, the state's bonded debt was $581,958,000, of which more than $445 million was limited obligations (rating A) and the remaining portion, general obligations (rating AA). The state tax levy is fixed by law at 2 mills. Equalized value of all property in the state approximates $18.2 billion.

Most state revenue comes from a 5 percent sales tax, (4.5 percent to be used by the state and 0.5 percent by local governments). No income tax is levied.

It is estimated that $85 million[1] is needed to provide adequate disposal of residential and commercial solid wastes. In November 1972, "Referendum 26" of Washington Futures Program made available $225 million for the construction of disposal facilities for both liquid and solid waste. This referendum was one of a group of six referenda presented by Washington

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[1] This $85 million is derived from the local solid waste plans and does not include collection.

Futures Program to the State legislature.[1] The primary purpose of this coordinated effort was to integrate the major capital needs for the 1970's into one comprehensive financing package, in order to give the state flexibility in seeking financing.

Capital will be raised through general obligation bonds. These bonds must be issued by 1980 but can be staged over several years. Referendum 26 does not stipulate particular breakdown for capital to be used for liquid waste and capital for solid waste facilities, and there is no schedule for capital spending. However, of the total $225 million, at least $30 million is earmarked for financial assistance to local governments[2] in the form of grants. The state will pay 50 to 75 percent of the local municipality's construction budget. Local governments may match their share, using any financing mechanism available to them (e.g., bonds, user charges, revenue sharing dollars). Funding will be dependent upon the availability of matching funds at the local level and compliance with the solid waste management act. Referendum 26 provided immediate allocation of $10 million[3] to local entities for construction of liquid waste control facilities. No funds have yet been appropriated to solid waste programs.

Observations

The passage of Referendum 26 underlines the fact that the State of Washington is committed to a program of solid waste management. The problem at this stage lies in the breakdown of the monies between liquid and solid waste programs. Furthermore, there is no schedule for capital spending, and local and regional governments do not know how much state financing will be available to them.

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[1] The total financing package proposed by Washington Futures Program amounted to $465 million. Of the six referenda (water supply facilities; outdoor recreation; community colleges; social and health service facilities; waste disposal facilities; and transportation), only the first five were approved by the voters (amounting to $415 million).

[2] No loans can be made to private enterprises. However, a local entity may lease its facilities to private operators.

[3] To provide immediate capital, the state may use bond anticipation notes.

Wyoming

The Rocky Mountain state of Wyoming has a population of 332,416 and a vast land area of 97,441 square miles.

Sanitary Engineering Services, an agency within the State Department of Health and Social Service, is responsible for developing the state's solid waste management plan. The regulatory aspect of environmental protection belongs to the Department of Environmental Surveillance and Control.

Neither the State Legislature, nor the governor, nor the Department of Health and Social Services consider solid waste management an essential sector. This attitude reflects a concern that state activity would be an infringement on municipal and individual rights because in Wyoming, the local dump enjoys a rather unique image. It is a center for recreational shooting. Wyoming has no staff for solid waste management; work in this area is performed by staff borrowed from the Water Quality Office.

Solid Waste System Background

Rugged individualism characterizes Wyoming's solid waste picture. Although larger municipalities such as Cheyenne and Caspar do have collection systems and some towns do use compactor trucks, the state lacks a well-developed comprehensive collection-disposal strategy. Private haulers and individual residents take the responsibility for carting the state's daily load of 664 tons of refuse to local dumps. Individual charges and limited allocations from taxes finance solid waste disposal in most communities. The publicly-financed portion of the operation lies in the land that has been supplied, purchased or leased by individual towns.

Wyoming is now in the primary stages of solid waste management. Its first state plan was submitted to the governor in November, 1972 by a state research team. Focusing on disposal systems now in operation, the study indicated that a majority of disposal sites are open dumps rather than "sanitary" landfills and are, therefore, environmentally unacceptable.

Recent Developments

The Federal Solid Waste Disposal Act of 1965, which required Wyoming to develop a state plan, served as the impetus motivating the state to study its present problems and to set its objectives. The Solid Waste Management Plan of November, 1972 established three environmental goals: elimination of health hazards; aesthetic improvement; and conservation of natural resources.[1]

To achieve these goals, the state proposed a program of action. Because municipalities had carried on only limited solid waste planning, the state saw its role as a provider of "guidelines, technical, and possibly financial assistance to those jurisdictions without acceptable plans."[2] Under the Plan the state will act in the following fields as well:

1. Encouraging public awareness of collection and disposal problems.
2. Personnel training.
3. Studies of disposal practices.
4. Funding.
5. Planning innovations.
6. State staffing.

Wyoming's first step in implementing the State Plan was to pass a statute prohibiting open burning dumps.[3] Combined with this was a new determination to enforce already existing statutes, many of them on the books since 1945, prohibit water pollution, nuisances and littering and regulate disposal site location.[4]

Revisions in state laws to require approval, licensing, and regular inspection of disposal sites will be proposed at future legislative sessions.

Wyoming then, has recently begun the first essential stages of a solid waste strategy, namely, public information and technical assistance. If it is to implement this program a budget must be accepted and staff positions created.

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[1] Wyoming, Solid Waste Management Plan, November 1972, pg. 37.

[2] Ibid, pg. 38.

[3] Wyoming Air Quality Standards and Regulations-1972 Section 13.

[4] Wyoming State Laws, Sections 35-196; 35-482; 35-465; 35-[illegible]4; 35-465; 35-466; 35-467; and 35-468.

Financing

At present, Wyoming does not have a budget for solid waste, nor does it have financial assistance program that could be used for grants or loans to municipalities.

The State Plan mentions two sources for solid waste funding:

1. A general category including federal grants, federal loans, municipal bonds, service charges, private operations, taxes, and loans.
2. A "matching" system which would offer state funds to any legal entity which invests capital to reclaim an open dump. The governor has voiced his support for legislation of this sort.

The state at this time has no debt, nor has it had any debt since 1952. In the past fiscal year, most states have clamored for Federal aid. In 1971, Wyoming,in contrast, had a modest $44 million in tax revenue, a $14 million carry forward from 1970, and a net expenditure of $3.6 million, for a surplus of $22 million. From these figures it is apparent that Wyoming spends far less on state-sponsored services than do its neighbors in the Far West.

Many communities in the state mirror this conservative fiscal approach. For them to purchase a suitable landfill, to staff the site and equip it would double the local budget. In addition, a low debt limit virtually prohibits investing in capital goods (except for those outside the general obligations of the city, such as hospitals and schools. In Wyoming the tradition of "rugged individualism" in the field of solid waste seems to mean that the state will advise local communities in upgrading landfills and that it will eventually regulate standards to ensure state-wide compliance. But there seems little indication that Wyoming will provide major planning, design, financing or operational services. These will remain local responsibilities.

The state's requirement that open burning dumps be closed down has been a cause for concern in many Wyoming towns. A brief and cursory survey of several will serve to illustrate the extent of the state's solid waste problem. In the 400-person town of Medicine Bow an aggressive mayor was elected on a "clean environment" platform. Under his aegis an ordinance that prohibits open burning was passed. The town dump was closed and Medicine Bow was left without a disposal alternative.

In Park County, near Yellowstone National Park, a local citizen owns a suitable dumping site and sells keys to the site for $5 per month. With the revenue from the fees, the owner occasionally provides a bulldozer to cover the waste.

Riverton, a town of 8,000 people, has had an acceptable landfill operation for two years, according to state personnel. The annual cost of this operation is $23,802, which includes amortization of a used Caterpillar and a Dragline.[1] Wyoming's smaller communities with population of 5,000 and less would have difficulty raising this amount, particularly for expenditures on heavy equipment.

Observations

Wyoming has just begun to implement a solid waste strategy, so there has been little time for investment in equipment and facilities. Solid waste is not a top priority of all programs in the Health Department and Sanitary Engineering Division. Officials believe that with the state's open spaces and uncongested towns and cities, "improved" dumps and new landfills will satisfy its needs for the next 30 years.

Some state officials do believe that smaller towns and communities will require financial aid to purchase equipment and to operate sanitary landfills.

Regional use of bulldozers, shredders, and other landfill equipment is not feasible because the population is so dispersed. The distance between towns means that transportation costs, and hence system costs, would far exceed the benefits derived from regional disposal or collection.

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[1] Letter to John F. Wagner, Sanitary Engineering Services, Wyoming Department of Health, February 28, 1972, from Day Evans, Riverton, Wyoming.

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